PESTICIDES ABSTRACTS

April 1977 - Vol. 10, No. 4

Abstracts 77-729 965

PSTAB 10(04) 193-243 (1977)

U.S. ENVIRONMENTAL PROTECTION AGENCY

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
Rm. EB-49, 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

CONTENTS

Volume 10 April 1977 No. 4

Page

General 193
(News items, letters, and editorials appearing in scientific and technical journals; information on production and use; and other items of general interest)

Monitoring and Residues 194
(Levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 208
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology 212
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 235
(Preparation of samples; analytical methods; instrumentation)

77-0729. Macek, K. (Author address not given). **New journal announcement.** *J. Chromatogr. Biomed. Appl.* 1(1): 1-2; 1977.

It has been suggested that chromatographic and/or electrophoretic papers oriented towards clinical chemistry should be published preferentially according to the method being exploited (i.e., in an analytical journal) rather than according to the problem being solved (i.e., in a medical journal). Since the demands placed upon firmly established chromatographic methods are beyond the limits of routine service work, specialization according to the method being used is to be preferred to specialization according to the problem being solved. Thus, a new journal (*Journal of Chromatography, Biomedical Applications*) will be published which will include papers dealing with the following aspects: developments in and applications of chromatographic and electrophoretic techniques related to clinical diagnosis; screening and profiling procedures; results from basic medical research with direct consequences in clinical practice; and the combination of chromatographic and electrophoretic methods with other physicochemical techniques such as mass spectrometry. Manuscripts dealing with drug and metabolite levels and with chromatographic and electrophoretic studies on environmental hazards will also be published.

77-0730. Ramade, F. (Universite de Paris-Sud, Orsay, France). **La pollution par les composes organohalogenes. [Pollution by organohalogen compounds.]** *Recherche* 7(69): 628-637; 1976. (French)

Insecticides are among the many organohalogens discussed in a review of the present and future toxic effects of these substances on the environment. The great chemical stability of organochlorine insecticides increases their potential contamination. On the average, at the time of insecticide application, about 50% of active matter is immediately dispersed into the air. The persistence of these compounds increases their chances of being ingested by living organisms and incorporated into the food chain. At the cellular level, these compounds are hydrophobic and lipophilic and thus have a strong affinity for cellular membranes rich in lipids. DDT, lindane, and chlorinated dienes are strong neurotoxins. DDT and most chlorinated cyclodienes are effective inhibitors of the membrane AT-Pases. Numerous organohalogens can induce genetic mutations. The exposure of six successive generations of mice to DDT concentrations of 2-250 ppm has resulted in a significant increase in hepatic tumors. While the systematic use of pesticides can favor the development of plant and animal strains resistant to these compounds, there are also numerous species which are highly sensitive to these compounds. The effects of organohalogen pesticides have been observed in many species of fish, crustaceans, and birds. On the long run, these pesticides may upset certain biogeochemical cycles, such as that of carbon, oxygen, and ozone.

77-0731. Lange, G. (Gesellsch. Strahlen- Umweltforsch., Neuherberg b. Muenchen, Munich, Germany). **Probleme der toxikologischen Pruefung und Bewertung von Umweltchemikalien. [The problem of toxicological testing and assessment of environmental chemicals.]** *Schriftenr. Ver. Wasser Boden Lufthyg.* (40): 11-19; 1973. (German)

General toxicological and hygienic problems of environmental chemicals and specifically of pesticides are discussed. Aside from acute and subacute poisoning, the continuous ingestion of low doses of pesticides from food, water, air, and through skin contact may impair adaptability and resistance to diseases and stress, and many interfere with the regulatory mechanisms of the organism without being accompanied by morphological, functional, or biochemical changes. It is extremely difficult to quantify these effects of pesticides because the physiological effects of changes in diet, weather conditions, and other factors may be on the same order of magnitude. The effects of the pesticide residues may be modified (enhanced or reduced) by other environmental chemicals, physical factors, and by the health status and age of the individuals.

77-0732. Thompson, N. P. (Pestic. Res. Lab., Food. Sci. Dep., Univ. Florida, Gainesville, FL). **Disappearance of dislodgable residues of five organophosphate pesticides on citrus leaves and fruit during dry and wet weather in Florida.** *Arch. Environ. Contam. Toxicol.* 5(1): 55-61; 1976. (4 references)

Citrus leaf discs and fruit taken from trees sprayed at recommended levels and twice recommended levels with ethion, parathion, azinphosmethyl, carbophenothion, and dioxathion were shaken with water and wetting agent for removal of dislodgable residues at 0, 1, 3, 5, 7, 14, and 21 days following treatment. The first portion of the field experiment was performed during a period of no rainfall (April) and the second when there was rainfall (July) in 1973. Four replicates of 50 leaf discs and 4 fruit, respectively, were averaged from each sampling to give data reported. A gas chromatograph equipped with a flame photometric detector was used for analysis. Dislodgable residues found decreased with increasing time following application and samples from the wet period were lower than those from the dry period. Moisture and temperature could account for the differences in the two sampling periods. (Author abstract by permission)

77-0733. Takade, D. Y.; Seo, M. S.; Kao, T S.; Fukuto, T. R. (Dep. Entomol., Div. Toxicol. Physiol., Univ. California, Riverside, CA). **Alteration of *O,O*-dimethyl *S*-[α-(carboethoxy)benzyl] phosphorodithioate (phenthoate) in citrus, water, and upon exposure to air and sunlight.** *Arch. Environ. Contam. Toxicol.* 5(1): 63-86; 1976. (11 references)

The fate of ^{32}P- and ^{14}C-labeled *O,O*-dimethyl *S*-[α-(carboethoxy)benzyl] phosphorodithioate (phenthoate) was determined in citrus, water, and upon exposure to air and sunlight. The products recovered from citrus and glass plates exposed to sunlight were unchanged phenthoate, phenthoate oxon, demethyl phenthoate, mandelic acid, *bis*-[α-(carboethoxy)benzyl] disulfide, *O,O*-dimethyl phosphorothioic and phosphorodithioic acid. Similar products generally were found in citrus leaf and fruit extracts. Phenthoate was fairly stable in phosphate buffered water with a half-life of approximately 12 days at pH 8.0. The major hydrolysis products were phenthoate acid, demethyl phenthoate and demethyl phenthoate oxon. (Author abstract by permission)

77-0734. Bowmer, K. H.; Higgins, M. L. (CSIRO, Griffith, N.S.W., Australia). **Some aspects of the persistence and fate of acrolein herbicide in water.** *Arch. Environ. Contam. Toxicol.* 5(1): 87-103; 1976. (7 refs)

Experimental data for the decay of acrolein approximated first order kinetics. The reaction continued to completion in local waters but in buffered solution (pH 5.1-8.6) an equilibrium was reached after reaction of about 92% of the acrolein. It is proposed that data presented on the effects of pH on decay of acrolein may be used as a conservation estimate of dissipation rates in water where nontarget organisms are at risk. In flowing water in two channels the 8 to 10 fold discrepancy between observed and predicted rates of dissipation was attributed to major losses in volatilization and adsorption. A relatively nonvolatile reaction product (which gave a positive reaction with dinitrophenylhydrazine) accumulated initially but dissipated rapidly, probably by microbiological processes, when acrolein concentrations fell below about 2 to 3 ppm. (Author abstract by permission)

77-0735. Miles, J. R. W.; Bolton, E. F.; Harris, C. F. (Agric. Canada, Res. Inst., London, Ontario). **Insecticide and nutrient transport in water, related to agricultural land use of a stream basin in Ontario, Canada.** *Arch. Environ. Contam. Toxicol.* 5(1): 119-128; 1976. (10 references)

Transport by stream water of insecticides and nutrients in Big Creek, Norfolk County, Ontario, Canada, was examined by combining concentrations of substrates with flow data. Big Creek has its headwaters in dairy cattle country, its central area is mainly devoted to tobacco growing, and its lower reaches contain mixed farming, corn and vegetables, etc., before it flows into Lake Erie. Three sampling sites were chosen to represent these 3 different land uses. Generally concentrations of substrates in the water were quite uniform at the 3 sites resulting in transport of quantities in proportion to stream flow. Certain anomalies occurred and are discussed. The 2 chief insecticides found were DDT and dieldrin. Analyses for potassium, calcium and magnesium indicated that these nutrient losses into the stream were area-rather than usage-dependent. Midseason variations in loss of nitrogen and phosphorus may be the result of agricultural practices in the three areas represented in this study. The largest quantities of all nutrients lost occurred early in the season before crops were established. (Author abstract by permission)

77-0736. Norris, L. A.; Montgomery, M. L.; Webb, W. L.; Schroeder, H. J., Jr.; Gross, F. (Pacific Northwest Forest and Range Exp. Station, Forest Serv., U.S. Dep. Agr., Corvallis, OR 97331). **Distribution of 2,4-D and picloram applied by a mist blower.** *Bull. Environ. Contam. Toxicol.* 16(6): 631-639; 1976. (6 references)

2,4-D and picloram were applied to a rectangular test grid (32.9 x 67 cm) using a truck-mounted, mist blower. The grid contained filter paper discs from which the herbicide residues were subsequently extracted and analyzed by gas chromatography. Both herbicides were deposited in a fan-shaped pattern largely contained by the test grid. More than 90% of the herbicide was in a triangle with the apex 4 m and the base 27 m from the mist blower. Only small quantities of herbicide were found along the edges and the back of the test grid, and the highest level of herbicide recovered along the perimeter of the grid was 0.88 mg 2,4-D/m^2. The total amount of herbicide deposited on the grid was 97.4% in the case of 2,4-D and 91.8% in the case ly apply herbicides on powerline rights-of-way using a truck-mounted mist blower. However, adequate attention

must be given to atmospheric conditions, method of application, and the use of effective drift control agents.

77-0737. Carman, G. E.; Gunther, F. A.; Westlake, W. E.; Iwata, Y. (Dep. Entomol., Univ. California, Riverside, CA 92502). **Reduction of foliar dislodgable pesticide residues from orange trees through spray-washing with water or lime solution.** *Bull. Environ. Contam. Toxicol.* 16(6): 646-651; 1976. (14 references)

Plots of navel orange trees in Riverside, California were sprayed with parathion 25% WP or dioxathion 8 lb/gal EC. The sprayed trees were then water washed with an oscillating boom spray rig or were washed with lime solution; washings were done 3-5 days post-treatment. With the water washings, the amount of foliar pesticide residue removed increased with the amount of water used and tended to increase with a high vehicle speed. Boom oscillation rate, nozzle pressure, spray-cone angle, and tilting of the boom had no effect on residue reduction. Foliar dislodgable residues were not decreased by a 100 gal/A low-volume lime application. The total amount of water used per tree was the main factor in reducing foliar residues at higher application rates, not the presence of lime in the spray solution. Good reduction was obtained with a water volume of 2,500 gal/A.

77-0738. Winter, M.; Thomas, M.; Wernick, S.; Levin, S.; Farvar, M. T. (Univ. Missouri, St. Louis, MO 63130). **Analysis of pesticide residues in 290 samples of Guatemalan mother's milk.** *Bull. Environ. Contam. Toxicol.* 16(6): 652-657; 1976. (16 references)

Between December 1973 and April 1974, milk samples were collected from 290 lactating women in Guatemala, a developing country in which pesticides have been used extensively. Hexane extracts of the samples were analyzed by gas-liquid chromatography. All of the samples showed measurable quantities (0.001 ppm or greater) of *p,p'*-DDT and *p,p'*-DDD. The pesticide levels varied greatly from community to community and the difference appeared to be closely associated with the use of DDT by the National Malaria Eradication Service. However, agricultural and other contamination was also involved. In two communities in which the malaria service stopped using DDT in 1970, there was a significant drop in the average DDT contamination levels between 1970 and 1974. A much less noticeable drop in contamination was observed in communities in which the use of DDT was continued for longer periods of time. Further research is needed to evaluate the neonatal health implications of elevated pesticide levels in mother's milk.

77-0739. Rajaram, K. P.; Sethunathan, N. (Lab. Soil Microbiol., Central Rice Res. Inst., Cuttack-6, Orissa, India). **Persistence and biodegradation of Hinosan in soil.** *Bull. Environ. Contam. Toxicol.* 16(6): 709-715; 1976. (6 references)

Twenty-gram samples of an alluvial soil were treated with 2000 μg of technical grade Hinosan (edifenphos) in chloroform, after which some of the soils were flooded with distilled water and some were maintained at 50% water holding capacity. In another experiment, autoclaved and nonautoclaved soil samples were treated with Hinosan, and in another experiment, mineral solutions containing technical Hinosan were inoculated with bacteria capable of growing in Hinosan medium. Hinosan degraded faster under flooded conditions than under nonflooded conditions and heat treatment of the soil prior to fungicide incorporation retarded the degradation of Hinosan. Three degradation products were detected in autoclaved and nonautoclaved soils, and two additional products were found in nonautoclaved samples. In the bacterial experiments, the inoculated bacteria (*Pseudomonas*) were able to use Hinosan as a sole carbon source. The addition of yeast extract, but not sucrose, further enhanced bacterial decomposition of the pesticide.

77-0740. Harper, D. B.; Smith, R. V.; Gotto, D. M. (Dep. Agric. Food Chem., Queen's Univ., Belfast, Northern Ireland). **BHC residues of domestic origin: a significant factor in pollution of freshwater in Northern Ireland.** *Environ. Pollut.* 12(3): 223-233; 1977. (22 references)

The concentration of BHC residues in the water of rivers discharging into Lough Neagh shows a high correlation with urban population density in the catchment area of the rivers. Investigations demonstrate that this correlation arises as a result of the discharge of sewage effluents containing BHC into the watercourses. BHC in such effluent appears to have a domestic rather than an agricultural or industrial origin, probably arising from the use of wood preservatives in the home. Studies on the effect of various concentrations of BHC on species of mayfly larvae indicate major reductions in survival time at γ-BHC levels as low as 100 ng/l. Thus, even the relatively low concentrations of BHC observed in Northern Ireland river waters and indeed in surface waters throughout the United Kingdom may well pose a threat to aquatic ecosystems, particularly in the vicinity of sewage outfalls.

77-0741. Srivastava, B. P.; Dadheech, L. N.; Nath, G.; Jat, N. R. (Coll. Agric., Univ. Udaipur, Udaipur, India 313001). **Persistence of carbaryl residues in and on okra fruits.** *Indian J. Agric. Sci.* 45(4): 139-144; 1975. (17 references)

In an experiment conducted in the rainy season carbaryl 0.25% and 0.50% spray at 1,500 litres/ha left initial deposits of 50.53 and 96.20 ppm on small fruits (1.2-2.5 cm), 27.20 and 58.03 ppm on medium-sized fruits (3.8-5.0 cm) and 17.53 and 40.20 ppm on fruits of normal marketable size (7.5-10.0 cm) in okra (*Abelmoschus esculentus* (L.) Moench). Carbaryl residues dissipated faster during the first 2-3 days and the residue from 0.25% spray reached well below the tolerance limit of 10 ppm on normal marketable fruits within 24 hr after treatment. In normal marketa-

ble fruits developed from medium-sized fruits and small flower buds also, the residue was well below the prescribed tolerance. The initial deposits from 0.25% and 0.50% carbaryl sprays were removed to the extent of 66.12% and 69.55% by washing, 41.81% and 24.88% by open cooking, 81.75% and 48.51% by steam cooking, and 79.24% and 77.01% by dehydration. The presence of carbaryl residues in okra seeds indicated that it has a mild systemic action.

77-0742. Bourke, J. B.; Nelson, T. R.; Eichler, D. (Dep. Food Sci. Technol., New York State Agric. Exp. Stn., Geneva, NY). **Residues and disappearance of triforine from various crops.** *J. Agric. Food Chem.* 25(1): 36-39; 1977. (6 references)

A convenient method for the residue analysis of triforine, piperazine-1,4-diylbis [1-(2,2,2-trichloroethyl)formamide], sensitive to 0.01 ppm is presented. Disappearance rate data and harvest residue data are presented. (Author abstract by permission)

77-0743. Chiba, M.; Northover, J. (Vineland Res. Stn., Agric. Canada, Vineland Stn., Ontario). **Distribution and dissipation of captafol applied to apple trees.** *J. Agric. Food Chem.* 25(1): 39-43; 1977. (14 references)

Seasonal changes of captafol residues on semidwarf apple trees were determined following a single application of Difolatan for early season apple scab control. Initial wood deposits of 126-128 $\mu g/cm^2$ declined to 36-2 $\mu g/cm^2$ at harvest at tree heights of 1.5 and 3.0 m, respectively. Deposits on cluster leaves declined from 6.4 $\mu g/cm^2$ (May 1) to 0.98 $\mu g/cm^2$ (June 6). The minimum deposit of captafol necessary for protection of leaves against apple scab was judged to lie between 0.1 and 1.0 $\mu g/cm^2$. During a 4-mm rainfall, rainwater collected under sprayed trees, with a wood deposit of 97 $\mu g/cm^2$ captafol, contained 0.65 $\mu g/ml$ of captafol. At harvest, whole apple residues were 0.0062 $\mu g/g$ with the highest residues associated with the peel. A simple thin-layer chromatographic technique was used to purify apple extracts prior to gas chromatographic analysis. (Author abstract by permission)

77-0744. Lichtenstein, E. P.; Katan, J.; Anderegg, B. N. (Dep. Entomol., Univ. Wisconsin, Madison, WI). **Binding of "persistent" and "nonpersistent" ^{14}C-labeled insecticides in an agricultural soil.** *J. Agric. Food Chem.* 25(1): 43-47; 1977. (16 references)

The extractability and formation of bound ^{14}C-labeled residues in an agricultural loam soil were investigated with the "nonpersistent" insecticides [^{14}C]methylparathion and [^{14}C]fonofos (Dyfonate) and with the "persistent" insecticides [^{14}C]dieldrin and *p,p'*-[^{14}C]DDT. With [^{14}C]methylparathion only 7% of the applied radiocarbon was extractable 28 days after soil treatment, while ^{14}C-bound residues amounted to 43% of the applied dose. With [^{14}C]fonofos, however, still 47% of the applied dose was extractable and 35% of the applied radiocarbon was bound. Only a fraction of the radiocarbon extracted from [^{14}C]methylparathion treated soil was associated with the parent compound, while extractable ^{14}C-labeled residues from the other insecticide-treated soils were primarily due to the presence of the parent compounds. Smaller amounts of soil-bound residues had been formed with the "persistent" insecticides, amounting after 28 days to only 6.5% of the applied [^{14}C]dieldrin and to 25% of the applied *p,p'*-[^{14}C]DDT, while 95 and 72%, respectively, were still recovered by organic solvent extraction. They differed from the organophosphorus compounds in their relatively low binding properties and their high extractability from soils. Contrary to results with [^{14}C]parathion, the mechanism of binding of [^{14}C]fonofos was not dependent on the presence of soil microorganisms. At higher application rates of the insecticides, relatively less radiocarbon was bound, possibly due to saturation of binding sites. Bound residues were found to be either nontoxic to fruit flies or of drastically reduced insecticidal activity. The significance of the formation of insecticide bound residues in soils in reassessing persistence of pesticides is discussed. (Author abstract by permission)

77-0745. Richey, F. A.; Bartley, W. J.; Sheets, K. P. (Res. Dev. Dep., Chem. Plast., Union Carbide Corp. Tech. Cent., South Charleston, WV). **Laboratory studies on the degradation of (the pesticide) aldicarb in soils.** *J. Agric. Food Chem.* 25(1): 47-51; 1977. (16 references)

Degradation of aldicarb samples separately ^{14}C labeled at three positions (*S*-methyl, *N*-methyl, and tertiary carbon) in Norfolk sandy loam, Lufkin fine sandy loam, and Lakeland fine sand soils has been studied under laboratory conditions. Extensive fragmentation of the aldicarb molecule was accompanied by recovery of up to 82.8% of the applied radiolabel as $^{14}CO_2$, the amount depending primarily on label position, incubation time, and soil type/pretreatment. Aldicarb sulfoxide and sulfone were the major solvent extracted metabolites. Part of the solvent unextracted radiolabel was isolated in conjunction with the humic and fulvic acid fractions of soil organic matter. (Author abstract by permission)

77-0746. Fleeker, J. R.; Lacy, H. M. (Dep. Biochem., North Dakota State Univ., Fargo, ND). **Photolysis of methyl 2-benzimidazolecarbamate.** *J. Agric. Food Chem.* 25(1): 51-55; 1977. (33 references)

Methyl 2-benzimidazolecarbamate (MBC, carbendazim), as a residue on silica gel G, was exposed to sunlight for 30 h. More than 90% of the compound was recovered. MBC in dilute aqueous solution was exposed to sunlight and to light from UV lamps. Less than 10% of the MBC was lost on exposure to sunlight for 40 hr, while greater loss occurred if riboflavin or acetone was added to the solution. Photooxidation of the benzene ring of MBC was the predominant reaction detected. Guanidine, car-

bomethoxyguanidine, and carbomethoxyurea were detected among the photolysis products. MBC was applied to the leaves of corn plants and the plants exposed to sunlight for 18 h. No photolysis products were detected in extracts of the plants. (Author abstract by permission)

77-0747. Holmstead, R. L.; Fullmer, D. G. (Dep. Entomol. Sci., Univ. California, Berkeley, CA). **Photodecarboxylation of cyanohydrin esters. Models for pyrethroid photodecomposition.** *J. Agric. Food Chem.* 25(1): 56-58; 1977. (14 references)

Benzyl esters in which the α position has been substituted with a cyano group, upon irradiation in either methanol or hexane give products resulting from photoelimination of carbon dioxide. The relative amount of photoeliminated product formed is dependent upon intermediate free-radical stability. The α-substituted and unsubstituted esters examined may serve as models for photodecomposition studies of pyrethroid insecticide chemicals in organic solvents. (Author abstract by permission)

77-0748. Bullard, R. W.; Thompson, R. D.; Kilburn, S. R. (U.S. Fish Wildlife Serv., Wildlife Res. Cent., Fed. Cent., Denver, CO). **Diphenadione residues in milk of cattle.** *J. Agric. Food Chem.* 25(1): 79-81; 1977. (10 references)

The mammillary transfer of diphenadione (2-(diphenylacetyl)- 1,3-indandione) into the milk of treated cows is an important health aspects of the use of this systemic anticoagulant in vampire bat (*Desmodus rotundus*) control. Milk of cows dosed intraruminally with diphenadione at the recommended 1-mg/kg level did not contain detectable levels of residues, whereas cows treated with 2.75 mg/kg contained 21.3 ppb or less at 12, 24, and 48 h posttreatment. There were no residues in samples after 72 h. In nursling calves the prothrombin clotting time did not change and there were no detectable residues in their blood plasma. It appears that the mammillary transfer of diphenadione, like that of other anticoagulants, is dose dependent. Even if cows are accidentally given 2.75 times that amount, and milk collected within 72 h after treatment is consumed, there are no apparent health hazards involved. (Author abstract by permission

77-0749. Szalkowski, M. B.; Stallard, D. E. (Dep. Food Sci. Technol., Univ. Calif., Davis, CA). **Effect of pH on the hydrolysis of chlorothalonil.** *J. Agric. Food Chem.* 25(1): 208-210; 1977. (6 references)

Aqueous solutions of chlorothalonil (2,4,5,6-tetrachloro isophthalonitrile) were prepared at 0.5 ppm, buffered at pH 5 to 9, and stored in the dark. No hydrolysis was observed at pH 7 or lower. At pH 9, chlorothalonil hydrolyzed to 4-hydroxy-2,5,6-trichloro isophthalonitrile and 3-cyano-2,4,5,6- tetrachlorobenzamide. The rate of decline of chlorothalonil followed first-order kinetics and was determined to be 1.8% per day using gas chromatographic and radiotracer techniques. (Author abstract by permission)

77-0750. Ambrosi, D.; Helling, C. S. (Pestic. Degradation Lab., Agric. Res. Serv., U.S. Dep. Agric., Beltsville, MD). **Leaching of oxadiazon and phosalone in soils.** *J. Agric. Food Chem.* 25(1): 215-217; 1977. (22 references)

The movement, on soil thin-layer chromatographic plates, of ^{14}C-labeled oxadiazon [2-*tert*-butyl-4- (2,4-dichloro- 5-isopropoxyphenyl)- Δ^2-1,3,4-oxadiazolin-5-one] and phosalone [*O,O*-diethyl *S*-(6-chloro-2-oxobenzoxazolin-3-yl) methyl phosphorodithioate] was compared with three standard pesticides, 2,4-D [(2,4-dichlorophenoxy) acetic acid], diuron [3-(3,4-dichlorophenyl)- 1,1-dimethylurea], and methylparathion [*O,O*-dimethyl *O*-(*p*-nitrophenyl) phosphorothioate]. Oxadiazon and phosalone were nearly immobile in four soils and moved to Rf 0.3 and 0.25, respectively, in Lakeland sandy loam. Extracts from soils incubated 6 months with oxidazon had a trace amount of highly mobile, unidentified radioactivity; most was immobile. Phosalone, aged 1 or 3 months in aerobic and flooded soils, was largely immobile but traces of radioactivity streaked to high *Rf* values. Phosalone predominated in both slightly mobile and highly mobile streaks, but was accompanied by several unknown components. (Author abstract by permission)

77-0751. Lee, A. H.; Lu, P. Y.; Metcalf, R. L.; Hsu, E. L. (Univ. Illinois, Urbana, IL). **The environmental fate of three dichlorophenyl nitrophenyl ether herbicides in a rice paddy model ecosystem.** *J. Environ. Qual.* 5(4): 482-486; 1976. (23 references)

The distribution and fate of three ^{14}C radiolabeled diphenyl ether herbicides, nitrofen (2,4-dichlorophenyl 4′-nitrophenyl ether), X-52 or methoxy-nitrofen (2,4-dichlorophenyl 3′-methoxy-4′-nitrophenyl ether), and bifenox (2,4-dichlorophenyl 3′-carbomethoxy- 4′-nitrophenyl ether), were evaluated in a laboratory rice (*Oryza sativa* L., Taichung Native No. 1) paddy model ecosystem. Nitrofen was relatively stable under model ecosystem conditions and was bioconcentrated and stored over a 33-day period in tissues of alga (*Oedogonium cardiacum* Wittrock), snail (*Physa* sp.), mosquito (*Culex pipiens quinquefasciatus* Say), and fish (*Gambusia affinis* Baird & Girard). The carbomethoxy group of bifenox served as an effective degradophore and tissue storage of the parent compound was minimal. The methoxy group of the methoxy-nitrofen was not an effective degradophore. The laboratory rice paddy model ecosystem is a useful tool for evaluating the environmental effects and fate of pesticides to be used in rice culture. (Author abstract by permission)

77-0752. Scifres, C. J.; McCall, H. G.; Maxey, R.; Tai, H. (Texas Agric. Exp. Stn., Dep. Range Sci., Texas A&M

Univ., College Station, TX). **Residual properties of 2,4,5-T and picloram in sandy rangeland soils.** *J. Environ. Qual.* 6(1): 36-42; 1977. (26 references)

Two watersheds were treated with one application of 2,4,5-T + picloram (1:1) at 1.12 kg/ha while one other watershed was treated for 2 consecutive years at the same herbicide rates. Residues of 2,4,5-T were reduced to trace levels [< 10 parts per billion (ppb)] in soils 7 days after application at one location, after 28 days at the second, and after 56 days at the third. Residues of 2,4,5-T were not detected below 15 cm and usually remained in the surface 2.5 cm of soil. Picloram was reduced to trace levels within 56 to 112 days after application, was not detected deeper than 60 cm, and was usually restricted to the surface 15 cm of soil. There was no evidence of subsurface lateral movement of either herbicide. Surface runoff water contained trace amounts of residue following storms for about 30 days after application. There was no evidence of residue carryover into the second year after treatment in water, soils, or vegetation. Monitoring of cumulative residues in water, soils, and vegetation showed that about 75% of the picloram was dissipated from the ecosystem within 28 days after application and over 90% was lost after 112 days. (Author abstract by permission)

77-0753. White, A. W., Jr.; Harper, L. A.; Leonard, R. A.; Turnbull, J. W. (USDA, ARS, Byron, GA). **Trifluralin volatilization losses from a soybean field.** *J. Environ. Qual.* 6(1): 105-110; 1977. (30 references)

Trifluralin (α,α,α-trifluoro- 2,6-dinitro- *N,N*-dipropyl-*p*-toludine) concentrations in air were measured. Volatilization losses from a 1.26-ha field during application at soybean [*Glycine max* (L.) Merr.] planting and for 120 days after were calculated. Air samples, collected at three heights above the soil on 9 days during the season, showed that distinct trifluralin air concentration gradients existed throughout the study with concentrations highest closest to the ground. The highest concentration was measured during the application period (prior to soil herbicide incorporation) when a trifluralin level of 16,500 ng/m^3 was recorded 20 cm above the ground. Generally, air concentrations were highest early in the season and decreased rapidly the first month. After herbicide incorporation, trifluralin air concentrations at 20 cm reached a maximum of 3,400 ng/m^3 on day 2, and never exceeded 100 ng/m^3 after day 35. Soil trifluralin levels at the 0.5-cm depth decreased from 1.65 to about 0.3 μg/g on day 35 and to about 0.1 μg/g after 120 days. Seasonal trifluralin volatilization loss, excluding the application period, was estimated to be 22.4% of that applied with vapor losses during application amounting to 3.5% of the applied herbicide. Thus, total seasonal aerial losses were 25.9% of the originally applied herbicide. Of the total aerial losses, 13 and 15% were lost during application and through day 1, respectively. About half was lost during the first 9 days, and 90% in 35 days. Combined seasonal losses by other pathways (excluding volatilization) were almost 2.5 times greater than aerial losses. (Author abstract by permission)

77-0754. Hargrave, B. T.; Phillips, G. A. (Dep. Environ., Fisheries Mar. Serv., Mar. Ecol. Lab., Bedford Inst. Oceanogr., Dartmouth, Nova Scotia, Canada). **DDT residues in benthic invertebrates and demersal fish in St. Margaret's Bay, Nova Scotia.** *J. Fish Res. Board Can.* 33(8): 1692-1698; 1976. (21 references)

Organochlorine residues (*p,p'*-DDT and its metabolites) were measured in samples of benthic invertebrates and demersal fish taken from St. Margaret's Bay, Nova Scotia. No other organochlorine compounds were present in detectable amounts. ΣDDT levels in whole organisms, excluding lipid-rich tissues, grouped as benthic epifauna, infauna, and demersal fish were not significantly different and thus no accumulation occurs in this food chain. Atmospheric supply is probably the major source of low levels of contamination and a detritus-based food web may equalize residue concentration between various feeding types. (Author abstract by permission)

77-0755. Iwanada, S. (Kanagawa Prefect. Gen. Agric. Inst., Hiratsuka, Kanagawa, Japan). [**Survey on the safety of pesticide residues.**] *Bus. Rep. Kanagawa Pref. Gen. Agric. Inst.*, 1975, p. 30. (Japanese)

The correlation between preharvest interval and pesticide residues was examined following application of malathion and diazinon to lettuce planted in open fields in the spring orgreenhouses in the autumn. Similar studies were performed with malathion, diazinon, and fenitrothion on eggplant sown in open fields. The Japanese established preharvest interval for eggplant is one day for malathion, three days (open field) and seven days (greenhouse) for diazinon, and three days for fenitrothion. For lettuce the values were 3, 14, and 14 days respectively for malathion, diazinon,and fenitrothion. Residues in and on crops grown in the open field were below established tolerance levels. However, residues exceeded the established tolerance in some greenhouse-grown lettuce.

77-0756. Korotkova, O. A. (Author abstract by permission). **Tiolkarbamaty (analiticheskii obzor).** [**Thiocarbamates (Analytical review.**] *Khim. Sel'sk. Khoz.* (5): 66-69; 1976. (16 references) (Russian)

Data are presented concerning the metabolism, persistance, toxicity, and residue dynamics of thiocarbamate concerning the metabolism, persistance, toxicity, and residue dynamics of thiocarbamate herbicides. These preparations have moderate persistence in soil; they are degraded in 2-4 months, but triallate persists in the soil for up to 10 months. Thiocarbamates are fairly readily decomposed by soil microorganisms, especially at elevated temperature and at increased soil moisture content. Triallate is not degraded in sterilized soil. Carbon dioxide, thiol, and amine are the metabolites in the soil. Thiocarbamates are readily metabolized in the warm-blooded organism. They are readily taken up by plants, in which they are degraded in a rather short time. Diallate, triallate, eptam, murbetol, and alipur inhibit the growth of soil fungi, stimu-

late aerobic saprophytic bacteria and sporulating bacteria, and suppress nitrification. Thiocarbamates are relatively toxic for aquatic organisms; their LC_{50} values range from 1 to 10 mg/liter. Diallate and triallate are not hazardous for bees. The maximum allowable concentrations standardized in the USSR are 0.1 mg/kg for killam in vegetables, tomatoes and sugar beets; 0.3 mg/kg for cycloate in beets; 0.2 mg/kg for molinate in rice; 0.004 mg/kg for molinate in air, and 0.025 mg/liter in water.

77-0757. Cremer, H. D.; Muskat, E. (Inst. Ernaehrungswiss. I, Justus-Liebig-Universitat Giessen, D-6300 Giessen, Germany). **Pathogene Faktoren in Lebensmitteln tierischer Herkunft. Teil 2: Unbeabsichtigt in oder auf Lebensmittel tierischer Herkunft gelangende Stoffe.** [**Pathogenic factors in foodstuffs of animal origin. Part 2: Accidental contamination of foodstuffs of animal origin.**] *Med. Klin.* 72(4): 137-140; 1977. (17 references) (German)

Studies and observations on the accidental contamination of foods of animal origin are reviewed. The pesticide residues present in meat and meat products are usually far below the levels which would be hazardous after prolonged consumption of such foods. Part of the organochlorine pesticides ingested by fowl is eliminated in the eggs; however, the residue levels are well below the maximum allowable concentration. Human milk usually contains larger amounts of organochlorine pesticides than does cow's milk, due to the mobilization of foreign substances, including pesticides, during lactation.

77-0758. McKenry, M. V.; Thomason, I. J. (Karney Hortic. Field Stn., Univ. California, Parlier, CA). **Dosage values obtained following pre-plant fumigation for perennials. I. 1,3-dichloropropene nematicides in eleven field situations.** *Pestic. Sci.* 7(6): 521-534; 1976. (11 references)

The movement of 1,3-dichloropropene nematicides in 11 different field situations was monitored. The eventual dosages of 1,2-dichloropropane and 1,3-dichloropropene achieved at various positions in the soil profile are reported. Soil moisture, temperature, texture and profile differences are indicated for each experiment. The influence of soil profile modification, surface sealing techniques and various methods and rates of application are reported. (Author abstract by permission)

77-0759. McKenry, M. V.; Thomason, I. J. (Kearney Hortic. Field Stn., Univ. California, Parlier, CA). **Dosage values obtained following pre-plant fumigation for perennials. II. Using special methods of applying methyl bromide and 1,3-dichloropropene nematicides.** *Pestic. Sci.* 7(6): 535-544; 1975. (12 references)

The movement of 1,3-dichloropropene and methyl bromide was monitored in various field situations involving fumigant application coupled with contemporary soil profile modification techniques. The soil moisture, temperature, texture and profile differences are reported in each case. A combination of soil modification and soil fumigation may provide for better plant response than either treatment alone. Spot and strip treatments may provide an efficient method of applying certain pre-plant fumigants to protect young perennials. (Author abstract by permission)

77-0760. Galley, J. D.; Foerster, L. A. (Dep. Zool. Appl. Entomol., Imp. Coll., London, England). **Phorate residues in aphid colonies on broad bean plants in relation to the site of application.** *Pestic. Sci.* 7(6): 549-552; 1976. (8 references)

Aphis fabae colonies were established on both leaflets of the second leaf of young broad bean plants. Doses of phorate sublethal to the aphids were applied to the roots or to the third leaf. The aphids, their honeydew and the foliage on which they were feeding were analyzed and the quantities of toxic and non-toxic radiolabel determined at intervals. Toxic metabolites were found in the aphids and the leaves but whereas the aphid colonies in all experiments contained approximately similar amounts of the toxic metabolites, the residues in the leaves on which they were feeding differed considerably. The leaves contained more than 100 times as much of these metabolites following the root treatment than after the foliar treatment. These results are discussed in relation to the aphids' feeding site and the probable transport routes of the toxicants. (Author abstract by permission)

77-0761. Khan, S. U.; Hamilton, H. A.; Hogue, E. J. (Chem. Biol. Res. Inst., Res. Branch., Agric. Canada, Ottawa, Ontario, Canada). **Fonofos residues in an organic soil and vegetable crops following treatment of the soil with the insecticide.** *Pestic. Sci.* 7(6): 553-558; 1976. (12 references)

Fonofos (*O*-ethyl *S*-phenyl ethylphosphonodithioate) was applied to an organic soil as band treatment at the rates of 1.12 and 2.24 kg/ha. The persistence of the insecticide and its translocation into onions and two rotation crops (lettuces and carrots) was studied under field conditions. Proportionally more residues persisted in the soil from the higher rate of application. In autumn, 4 months after soil treatment, about 40-48% of the initially recovered levels of fonofos remained in soil. However, the amount of fonofos present at the harvest time during the second growing season was only 16-26% of the insecticide concentration found in spring. Onions harvested 4 months after application of fonofos had no detectable residue (> 0.005 mg/kg) whereas lettuces and carrots grown in the following year contained fonofos in various amounts. At the lower rate of application the insecticide residues in lettuces and carrots were < 0.005 and 0.025 mg/kg, respectively, and those from the higher application rate were 0.012 and 0.036 mg/kg. About 72-80% of the residue could be removed by peeling the carrots. No residue of the oxygen analogue, *O*-ethyl *S*-phenyl ethylphosphonothioate (I), was detected in any soil or crop samples. (Author abstract by permission)

77-0762. Arsenault, R. D. (Product Develop. Dep., Forest Products Div., Koppers Company Inc., Pittsburgh, PA). **Penatchlorophenol and contained chlorinated dibenzodioxins in the environment.** *Proc. Annu. Meet. Am. Wood Preserv. Assoc.* 72: 122-148; 1976. (118 references)

The potential occupational health and environmental hazards of pentachlorophenol and the polychlorinated dibenzo-*p*-dioxins found in technical PCP have been greatly exaggerated. The technical PCP produced today in the United States does not present an unreasonable risk to man or the environment when used properly; and there are no unreasonable adverse effects on the environment caused by the use of technical PCP as a wood preservative. PCP does not accumulate in the environment because it is degraded by UV light and by microorganisms in soil and water. The same mechanisms that degrade PCP also degrade the dioxin impurities. There is no hazard from burning PCP treated wood. There is no justification for placing "least detectable" tolerance limits on PCP in water. Most of the information and data contained in this paper has been presented to EPA in various documents for the purpose of supporting preservative registration on current PCP products.

77-0763. Dejonckheere, W.; Steurbaut, W.; Kips, R. H. (Univ. Etat-Gand, Fac. Sci. Agron., Ghent, Belgium). **Residus de pesticides dans la viande et les produits de viande.** [**Pesticide residues in meat and meat products.**] *Rev. Agric. (Brussels)* 28(6): 1541-1545; 1975. (11 references) (French)

A variety of meats, such as pork, beef, ham, corned beef, and salami were tested for pesticide residues. The following organochlorine pesticide residues were present: hexachlorobenzene (HCB), lindane (BHC) and its isomers, heptachlor epoxide (Hepo), dieldrin, *p,p'*-DDT, *p,p'*-DDD (TDE), and *p,p'*-DDE, predominantly in small concentrations. However, established limits were exceeded four fold by HCB (0.5 ppm), eight times by Hepo (0.2 ppm), and four times by dieldrin (0.2 ppm). HCB and *p,p'*-DDT and its metabolites were found most often in pork fat, while Hepo and dieldrin were found most often in beef fat. Sources of pesticides were mainly industrially packed animal feed and vegetables.

77-0764. .Demoor, H.; Huyghebaert, A. (Univ. Etat-Gand, Fac. Sci. Agron., 9000 Ghent, Belgium). **Residus de produits herbicides dans le lait.** [**Herbicide residues in milk.**] *Rev. Agric. (Brussels)* 29(2): 323-339; 1976. (49 references) (French)

The residues of 38 herbicides in cow's milk are discussed based on 56 literature sources. It appears that most of these herbicides, following per os ingestion, do not leave residues in milk. In most cases the cow excretes 99.9% of the herbicides in the urine and feces.

77-0765. Hernandez, L. M.; Gonzalez, M. J.; Baluja, G. (Inst. Quim. Organ. Gen., Madrid, Spain). **Contaminacion del medio por plaguicidas. IX. Residuos de insecticidas clorados, difenilos policlorados y mercurio en sustratos bioticos y abioticos del rio Guadalquivir.** [**Environmental contamination by organochlorine pesticides. IX. Chlorinated insecticides, polychlorinated biphenyls (PCBs) and mercury residues in the biotic and abiotic substrata of the Guadalquivir river (Spain).**] *Rev. Agroquim. Tecnol. Aliment.* 16(2): 279-292; 1976. (11 references) (Spanish)

Analyses were performed on the abiotic substratum and first links in trophic chains of the ecosystems established in the area of the Guadalquivir river in Spain in an attempt to determine the incidence of organochlorine and mercury contamination in this ecologic system. Very low residue levels of these chemicals were found in all samples, although DDT, its derivatives, and PCBs were found at higher levels in some species. Related residue concentrations showed biological magnification in different trophic levels. In the time between 1973 and 1975, organochlorine residue levels increased 1.4 fold.

77-0766. Smoczynski, S.; Jaworski, J.; Borejszo, Z.; Kleppin, R. (Inst. Phys. Chem. Nutr., Acad. Sci. Tech. Olsztyn, Poland). **Chlorowane weglowodory w serach dojrzewajacych II. Sery: Romadur, brie i camembert.** [**Chlorinated hydrocarbons in ripening cheeses II. Romadur, brie and camembert cheeses.**] *Rocz. Inst. Przem. Mlecz.* 16(2): 55-61; 1974. (9 references) (Polish)

Changes in chlorinated hydrocarbon content during manufacture and ripening of soft cheeses were monitored. The chemicals, α-HCH, γ-HCH, DDT, DDD and DDE, were measured in Romadur, Brie and Camembert cheeses by a gas-chromatographic method. All the chlorinated hydrocarbons in the cheese milk passed to the fresh cheese curd. No statistically significant changes were noted in the content of the determined compounds in cheese milk fat when compared with fat of fresh cheese curd. During the 42-day ripening period of Romadur cheese and the 21-day ripening period of Brie and Camembert cheeses, no significant changes in insecticide content of these cheeses were noted.

77-0767. Bierska, J.; Laskowski, K. (Dep. Raw Mat. Inst. Dairy Ind., Warsaw, Poland). **Wplyw zabiegow technologicznych podczas produkcji mleka w proszku na zawartosc pestycydow chloroorganicznych.** [**The influence of technological processes during milk powder production upon the content of chloroorganic pesticides.**] *Rocz. Inst. Przem. Mlecz.* 16(3): 77-87; 1974. (12 references)

Changes in DDT, DDD (TDE), and DDE content in milk during industrial production of spray-dried whole milk powder were determined. From each production cycle, raw, pasteurized, evaporated, and powdered milks were examined by a modified Gertig's method. Pasteurization did not significantly lower either the DDT or DDT content or the sum of the DDD + DDT + DDE in the milk. The content of these residues was lowered by milk evaporation and drying. The total loss of these residues

amounted to about 30% with the greatest losses being observed during evaporation. Analysis of individual components showed that DDD residues were lowered most significantly during the drying process rather than during milk evaporation.

77-0768. Crosby, D. G.; Wong, A. S. (Dep. Environ. Toxicol., Univ. California, Davis, CA). **Environmental degradation of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD).** *Science* 195(4284): 1337-1338; 1977. (16 references)

Herbicide formations containing known amounts of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) and exposed to natural sunlight on leaves, soil, or glass plates lost most or all of the TCDD during a single day, due principally to photochemical dechlorination. Despite the known persistence of pure TCDD, it is not stable as a contaminant in thin herbicide films exposed to outdoor light. (Author abstract by permission)

77-0769. Nakayama, H. (Res. Inst., Joint Coop. Assoc. Herbic. Plant Regul., Japan). [**Recent topics on herbicides.**] *Shokubutsu No Kagaku Chosetsu (Chem. Reg. Plants)* 11(1): 9-18; 1976. (8 references) (Japanese)

After describing the present status of herbicides in Japan, their effects in combination, and the mechanism of their action, the residue problems of herbicides were introduced. Although many kinds of herbicides are decomposed swiftly in soil, some of them, e.g., atrazine, dichlobenil, diuron, fenac, monuron, neburon, picloram, propazine, simazine, and trichloroacetic acid remain more than a year in soil, and the residues damage crops planted in the next season. However, it is said that herbicides do not severely affect the soil organisms, except for bacteria concerning nitration. The contamination of lake sediments by the runoff of herbicide from fields remained for 120 days to 3-8 years in some cases, with possible damage to the livers of small fish in the lake (2,4-D, MCPA, DNOC, PCP, simazine, paraquat, and diquat).

77-0770. Kaufman, D. D. (Agric. Environ. Qual. Inst., Agric. Res. Serv., Beltsville, MD 20705). **Biodegradation and persistence of several acetamide, acylanilide, azide, carbamate, and organophosphate pesticide combinations.** *Soil Biol. Biochem.* 9(1): 49-57; 1977. (26 references)

The effect of potassium azide, diazinon, phorate, carbaryl, and *p*-chlorophenyl methylcarbamate (PCMC) on the biodegradation and persistence of several amide, carbamate, and urea herbicides in soil and microbial culture systems was examined. KN_3 inhibited the biodegradation of isopropyl *m*-chlorocarbanilate (chlorpropham) in both soil perfusion and microbial culture system, but was limited in increasing chlorpropham persistence in soil under greenhouse conditions. PCMC and diazinon inhibited the metabolism of chlorpropham by isolated cultures of soil bacteria (*Pseudomonas striata* Chester and *Achromobacter* sp). Phorate inhibited chlorpropham metabolism by *P. striata*, but did not inhibit chlorpropham metabolism by *Achromobacter* sp. Carbaryl, PCMC, and diazinon increased the persistence of chlorpropham in soil under greenhouse conditions. PCMC also inhibited the microbial metabolism of propham, propanil, 2-chloro-*N*,*N*-diallyacetamide (CDAA), fluometuron, and diuron, but not that of propachlor in isolated culture systems.

77-0771. Elzeftawy, A.; Mansell, R. S.; Selim, H. M. (Soil Sci. Dep., Univ. Florida, Gainesville, FL 32611). **Distributions of water and herbicide in Lakeland sand during initial stages of infiltration.** *Soil Science* 22(5): 297-307; 1976. (14 references)

Penetration depths and concentration distributions were determined in columns of Lakeland sand for surface-applied 2,4-D herbicide during initial stages of steady water infiltration. Water was applied with application rates, R, of 2 and 4 cm/hr to soil with initial water contents of 0.20, 0.11, and 0.01 cm^3/cm^3. Increasing R resulted in faster rates of advance for both the water wetting fronts and the depths of 2,4-D peaks. Larger initial water content values, however, increased the rate of advance for the wetting front but did not affect the location for 2,4-D peaks. Penetration of 2,4-D peaks per unit of water applied to the soil was observed to be independent of both R and initial content during initial stages of water infiltration. Distributions of 2,4-D concentration as calculated from water and solute transport equations were observed to lag slightly behind experimentally measured distributions.

77-0772. Akins, M. B.; Lewis, R. J. (Dep. Plant Soil Sci., Univ. Tennessee Agric. Exper. Stn., Knoxville, TN). **Chemical distribution and gaseous evolution of arsenic-74 added to soils as DSMA-^{74}As .** *Soil Sci. Soc. Am. J.* 40(5): 655-658; 1976. (17 references)

Gaseous evolution of ^{74}As from a soil treated with arsenic-74 labeled disodium methanearsonate (DSMA-^{74}As) at 100 μg/g was a function of organic matter addition and moisture conditions. Loss of ^{74}As was greatest from soils that received an exogenous carbon source and were maintained under wet conditions. Arsenic-74 sorbed by soils of pH 4, 6, and 8 was fractionated by a differential dissolution procedure commonly used for phosphorus. Iron arsenate (soluble in 0.1*N* NaOH) was the most abundant form followed by aluminum arsenate (soluble in 0.5*N* NH_4F). The soils generally contained more aluminum arsenate at pH 4 than at pH 6 or 8. Calcium arsenate fractions (soluble in 0.5*N* H_2SO_4) were usually higher at pH 6 and 8 than at pH 4. Water-soluble forms and nonextractable forms were inversely proportional to each other.

77-0773. Hess, R. E.; Blanchar, R. W. (Dep. Soil Sci., Univ. California, Riverside, CA 92502). **Arsenic stability in contaminated soils.** *Soil Sci. Soc. Amer. J.* 40(6): 847-852; 1976. (19 references)

Various Al, Ca, Fe, Mn, and Pb arsenate compounds were formed and their solubility products determined. The amout of arsenate in solution for each of the compounds could be predicted as follows: $AlAsO_4 \cdot 2H_2O(pAsO_4 = 24.51\text{-}3pH)$, $FeAsO_4 \cdot 2H_2O$ or $Fe(OH)_3 FeAsO_4(pAsO_4 = 26.07\text{-}3pH)$, $Ca_3(AsO_4)_2\ 14H_2O(pAsO_4 = 9.29\text{-}1.5pCa)$, $Pb_3(AsO_4)_2 \cdot 4H_2O(pAsO_4 = 19.75\text{-}1.5pPb)$, and $Mn_3(AsO_4)_2$ ($pAsO_4 = 35.6\text{-}12.8Eh\text{-}2.3pH$), or ($pAsO_4 = 47.3\text{-}25.3$ Eh-3pLi), with either Mn_2O_3 or MnO_2. Samples from Sharpsburg and Menfro soils were equilibrated for 7 days at 25°C with dilute HCl and NaOH. Aluminum, Fe, Ca, Mn, Pb, and As contents and pH and E (platinum) were determined on the solution portions. The value of pAl + 3pOH, pAL + $pAsO_4$, pFe + 3pOH, pFe + $pAsO_4$, 3pCa + $2pAsO_4$, 3pMn + $2pAsO_4$, and 3pPb + $2pAsO_4$ were computed for each soil. The values of the ion products indicated that equilibrium solutions from both soils were undersaturated with respect to Al, Fe, and Ca and that Pb and Mn arsenate were stable in the Menfro and Sharpsburg soils.

77-0774. Leoni, V. (Ist. Ig. "G. Sanarelli", Univ. Studi di Roma, Rome, Italy). **Ricerche sui residui nel frumento disinfestato in silo con tetrachlorvinphos.** [**Research of residues on wheat disinfested with tetrachlorvinphos in silos.**] *Tec. Molitoria* 25(19-20): 761-765; 1974. (Italian)

Residues were determined in two batches of wheat, one treated with 8.8 ppm tetrachlorvinphos at 24% active matter and the other with 10.8 ppm tetrachlorvinphos at 70% active matter. In the first batch, 170 days after treatment, there were 2.9 ppm left. Washing the grains removed over 60% of the residue, and about 0.6 ppm were subsequently removed during milling so that the fine flour and meal contained 0.08 and 0.12 ppm respectively. In the second batch, at 170 days after treatment, there were 5.5 ppm left. About 2.6 ppm were removed during washing and about 1.2 ppm during milling. The fine flour and meal contained 0.40 ppm and 0.57 ppm respectively.

77-0775. Leidy, R. B.; Sheets, T. J.; Nelson, L. A. (Pestic. Residue Res. Lab., North Carolina State Univ., Raleigh, NC 27607). **Residues from two formulations of methyl parathion on flue-cured tobacco.** *Tobacco Sci.* 21(10): 1-4; 1977. (9 references)

Immediately after field application of the encapsulated (ENCAP) formulation of methyl parathion, residues on bottom leaves of flue-cured tobacco averaged 15.6 and 26.2 ppm at the 0.56 and and 1.12 kg/ha rates, respectively. Corresponding values for the emulsifiable concentrate (EC) formulation were 14.7 and 25.3 ppm. Middle leaves contained residues approximately 2.4 times greater than lower leaves, and residues on upper leaves were about 2.4 times greater than middle leaves. Average methyl parathion residues on green tobacco from EC-sprayed plots were only 2 to 5% of those for ENCAP-sprayed plots 1, 3, and 5 days after application. Methyl paraoxon residues were highest at day 1 on leaves from the middle and top stalk positions and day 3 on those from the bottom stalk position. Losses of total residues (methyl parathion plus methyl paraoxon) during curing ranged from about 90 to 94% for ENCAP-treated tobacco. For EC-treated tobacco, residues were so low after flue-curing that an accurate determination of the loss due to curing could not be made.

77-0776. Suzuki, T.; Shishido, S.; Urushiyama, K. (Dept. Public Health, Tohoku Univ. Sch. Med., Sendai, Japan). **Mercury in cigarettes.** *Tohoku J. Exp. Med.* 119(4): 353-356; 1976. (4 references)

The contribution of cigarette smoking to human mercury uptake was studied. According to the length of the cigarette smoked, the amount of mercury in smoke varied from 13.9 to 34.3 ng. The unit length of cigarettes, 1 cm, ca. 140 mg of leaf and 6 mg paper, when smoked, released about 5 ng of mercury into the smoke in one experiment and 7 ng in another. The levels of mercury in these present tests are much lower than the data previously reported in 1971 and 1966. This reduction is probably due to the suggestion made in 1967 that the use of mercurials as seed disinfectants be discontinued and some replacement found. The filter attached to cigarettes was partly effective in trapping mercury, but the amount of mercury found in the smoke was 30-50% of the total amount contained in the entire leaf and paper of a cigarette. In what state the mercury in smoke exists is not known. If it is a vapor, 75-85% of the mercury will be retained in the human body. If 20 cigarettes are consumed/day, 336 ng of mercury will be retained by the human body, given specific conditions.

77-0777. Kan, C. A.; Bouwstra, E. (Instituut voor Pluimveeonderzoek 'Het Spelderholt', Beekbergen, The Netherlands). **Residuen van organochloor bestrijdingsmiddelen in pluimveevlees en eieren in Nederland in de periode maart 1975 tot maart 1976.** [**Residues of organochlorine pesticides in poultry and eggs in the Netherlands, March 1975-March 1976.**] *Voedingsmiddelentechnologie* 10(2): 10-11; 1977. (4 references) (Dutch)

Some 200 egg samples and 250 poultry fat samples collected between March 1975 and March 1976 in the Netherlands were analyzed for organochlorine pesticide residues. The residue levels were below the maximum allowable levels in all egg samples, while the maximum allowable concentrations for total DDT and for the sum of aldrin and dieldrin in poultry fat were exceeded only in one fat sample each. Compared with the levels measured during the 1972-1973 period, the pesticide residue levels show considerable reductions both in eggs and in poultry fat.

77-0778. Leistra, M.; Dekkers, W. M. (Lab. Res. Insecticides, Wageningen, The Netherlands). **Computed leaching of pesticides from soil under field conditions.** *Water Air Soil Pollut.* 5(4): 491-500; 1976. (19 references)

Pesticide behavior in soil after spring application to

a sandy loam field with a potato crop was simulated with a computer model. Special attention was paid to the risk of leaching through the upper meter of soil in catchment areas. Unsaturated water flow resulting from rainfall was modeled in some detail. Uptake of water and solute by the developing root system of the annual crop was included in the model. The computations were carried out for hypothetical pesticides with first-order decomposition rate constants in soil in 0.03, 0.01, 0.003, and 0.001/day at 20°C. Adsorption decreased with increasing soil depth and the adsorption coefficient for the top layer ranged from 0.0 to 10.0. For 20 combinations of decomposition rates and adsorption strengths, the extent of leaching from a top layer 1 m thick was computed. With a decomposition rate constant at 20°C of 0.03/day or higher, leaching was extremely low; with 0.01/day leaching was 1.7% of the dosage or lower. For compounds with a high persistence and mobility, leaching from the soil ranged up to about 10% of the dosage or more. Besides decomposition, uptake by plants was an important factor in reducing leaching, particularly for the weakly adsorbed and comparatively persistent compounds.

77-0779. El-Dib, M. A.; Aly, O. A. (Water Pollut. Contr., Nat. Res. Ctr., Dokki, Cairo, Egypt). **Persistence of some phenylamide pesticides in the aquatic environment. I. Hydrolysis.** *Water Res.* 10(12): 1047-1050; 1976. (9 references)

Phenylamide pesticides are a group of closely related compounds, namely phenylcarbamates, phenylureas and anilides. Their hydrolysis in aqueous solutions and the kinetics of the reaction were investigated. The observed reactivity of phenylamides and their susceptibility for nucleophilic attack by OH- ions are mainly linked with the polarity of the carbonyl carbon atom. Hydrolysis at measurable rates was only affected in high alkaline solutions. At pH values which dominate in natural surface waters, these compounds are liable to maintain their stability and chemical hydrolysis will be a minor route for their degradation in the aquatic environment.

77-0780. Watson, J. R. (Dep. Soil Sci. Plant Nutr., Univ. Western Australia, Nedlands, WA 6009, Australia). **Seasonal variation in the biodegradation of 2,4-D in river water.** *Water Res.* 11(2): 153-157; 1977. (13 references)

There is a marked difference in the stability of 2,4-D in water and mud samples from rivers with different types of land use within their catchments. Furthermore, the effect is seasonal, with maximum breakdown occurring during the winter flood condition. Although it has not been possible to distinguish contributory factors in the present study, a more detailed experiment currently in progress should indicate more clearly the relative contributions of micro-organisms, nutrient levels, suspended sediments and on-farm practices. The study has highlighted the importance of flood conditions in the removal of undesirable pollutants by natural purification processes.

77-0781. Smith, A. E. (Agric. Canada, Regina Res. Stn., Regina, Saskatchewan, Canada). **The hydrolysis of herbicidal phenoxyalkanoic esters to phenoxyalkanoic acids in Saskatchewan soils.** *Weed Res.* 16(1): 19-22; 1976. (6 references)

The hydrolysis of the *iso*-propyl, *n*-butyl- and *iso*-octyl esters of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), the *n*-butyl ester of 2,4-dichlorophenoxybutyric acid (2,4-DB) and the *iso*-octyl ester of 2,4-dichlorophenoxypropionic acid (2,4-DP) was studied in four prairie soils of differing textures and pH at 25 ± 1°C. The esters were analyzed using gas chromatography. After 24 h in soils at wilting point moisture, and above, less than 20% of the applied *iso*-propyl and *n*-butyl esters could be recovered from one soil type and none from the remaining three. Loss of the *iso*-octyl esters was slower; however, no trace of the 2,4,5-T and 2,4-DP esters was observed in any of the moist soils after 48 and 72 h respectively. In all cases loss of all esters from air-dried soils was minimal. The phenoxyalkanoic acid hydrolysis products were recovered from all soil types treated with the various esters and identified using thin-layer chromatography. (Author abstract by permission)

77-0782. Bond, W.; Roberts, H. A. (Nat. Veg. Res. Stn., Wellesbourne, Warwick, U.K.). **Persistence of methazole activity in soil.** *Weed Res.* 16(1): 23-26; 1976. (6 references)

Methazole [2-(3,4-dichlorophenyl) -4- methyl-1,2,4-oxadiazolidine- 3,5-dione] was applied post-emergence at 2.1 kg/ha to crops of onion (*Allium cepa* L.) grown on a sandy loam and the activity present in the surface 0-5 cm of soil assessed by bioassay. In spring-sown crops, activity at harvest varied from 25 to 78% of the initial activity in different years; losses were restricted by low temperature and low rainfall. In autumn-sown crops, little loss occurred during winter and most of the activity remained in the surface 0-5 cm. The results emphasize the need for caution in choice and timing of following crops. (Author abstract by permission)

77-0783. Hammerton, J. L. (Fac. Agric., Univ. West Indies, Kingston, Jamaica). **Problems of herbicide assessment in peanuts in Jamaica.** *Weed Res.* 16(1): 27-35; 1976. (14 references)

Delays of 40 or 60 days in weeding peanuts (*Arachis hypogaea* L.) gave lower yields and fewer pods per plant but did not affect seed number per pod. Yield, pod number per plant, seeds per pod and mean weight per seed were all less in unweeded plots. In three herbicide trials crop yields were not closely correlated with crop vigor scores made several weeks before crop maturity, or with weediness scores. Correlations between yields and weed dry weights were better, but certain high-yielding herbicide treatments gave poor weed control and in some cases had low crop vigor scores. Most yield differences reflected differences in pod number per plant, with additional smaller compensating or additive effects on the other components. Certain

herbicides apparently gave high mean seed weights without diminishing seed numbers per pod. Pre-emergence alachlor was the most promising herbicide, combined with preplant incorporated vernolate if nutgrass was serious. Napropamide and metobromouron merit further testing. (Author abstract by permission)

77-0784. Mathur, S. P.; Belanger, A.; Khan, S. U.; Hamilton, H. A.; Greenhalgh, R.; MacMillan, K. A. (Soil Res. Inst., Res. Branch, Agric. Canada, Ottawa, Ontario). **Influence of field-applied linuron and paraquat on the microflora of an organic soil.** *Weed Res.* 16(3): 183-189; 1976. (21 references)

A pre-emergence application of paraquat at 2.24 kg a.i. (active ingredient)/ha was made to a plot on which onions and lettuce were grown; and similar broadcast applications of linuron, both with and without carbofuran, at two field rates, to plots on which carrots were grown. Paraquat generally increased the bacterial and actinomycetal populations while linuron inhibited the same but enhanced the numbers of fungal propagules, although it decreased the proportion of soil penicillia in the population. The overall effect of linuron was not changed by the admixture of carbofuran. However, the changes in microbial populations by either herbicides were not substantial enough to make gross or lasting differences in levels of available N and P_i and in the CO_2 evolution rate. (Author abstract by permission)

77-0785. Parochetti, J. V.; Dec, G. W., Jr.; Burt, G. W. (Dep. Agron., Univ. Maryland, College Park, MD). **Volatility of eleven dinitroaniline herbicides.** *Weed Sci.* 24(6): 529-532; 1976. (16 references)

Vapors of 11 dinitroaniline herbicides from soil were trapped in a Florisil column under controlled laboratory conditions for a 3-hr period. No vapor losses of nitralin [4-(methylsulfonyl)- 2,6-dinitro-*N*,*N*- dipropylaniline] and oryzalin (3,5-dinitro-N_2,N_4- dipropylsulfanilamide) were detected at the highest temperature, 50 C, from moist Lakeland sand with an air flow of 50 ml/min; whereas, under the same conditions vapor losses approached 25% for benefin (*N*-butyl-*N*- ethyl-α,α,α-trifluoro-2,6- dinitro-*p*-toluidine), profluralin [*N*-(cyclopropylmethyl)- α,α,α-trifluoro-2,6- dinitro-*N*-propyl-*p*- toluidine] and trifluralin (α,α,α-trifluoro- 2,6-dinitro- *N*,*N*-dipropyl- *p*-toluidine). Vapor losses for the remaining herbicides studied were moderate with values ranging between 2 and 13%. Volatility of all herbicides increased with increasing temperatures of 30, 40, and 50 C. Vapor losses for each herbicide from Hagerstown clay loam, Littleton silt loam and Lakeland sand were statistically different for five of the 11 herbicides. (Author abstract by permission)

77-0786. Beestman, G. B.; Deming, J. M. (Res. Dep., Monsanto Agric. Prod. Co., St. Louis, MO). **Triallate mobility in soils.** *Weed Sci.* 24(6): 541-544; 1976. (13 references)

Laboratory studies were conducted to measure the relative volatility of triallate [*S*-(2,3,3-trichloroallyl) diisopropyl thiocarbamate] from soils and to determine the effect of surfactants on triallate mobility. Significant volatilization occurred from continuously moist soils under constant air exposure but triallate did not volatilize more rapidly than herbicides which do not respond to incorporation. Volatilization rates from Ray silt soil fell in the order of propachlor (2-chloro-*N*- isopropylacetanilide) > triallate > alachlor [2-chloro-2',6'- diethyl-*N*-(methoxymethyl) acetanilide] and from Drummer silty clay loam were propachlor > alachlor > triallate. In suspension studies soils reversibly adsorbed 93 to 98% of the triallate in aqueous solution. With soil at field moisture capacity, the concentration of triallate in soil solution was 13 ppbw without surfacant and 14 ppbw with 3 parts emulsifier blend to 1 part of triallate (w/w). With this level of emulsifier 92% of triallate applied to the soil surface remained in the upper 3 cm of soil following a 15.2-cm simulated rainfall. Without surfactant 99% remained in the upper 3 cm of soil. Lower triallate mobility in moist soils observed in this study coupled with the strong dependence of triallate bioactivity as reported by others strongly suggests that deactivation by dry surface soils rather than volatility is primarily responsible for the triallate response to incorporation. (Author abstract by permission)

77-0787. Gaynor, J. D.; Volk, V. V. (Res. Stn., Agric. Canada, Harrow, Ontario). **Surfactant effects on picloram adsorption by soils.** *Weed Sci.* 24(6): 549-552; 1976. (23 references)

The effects of soil organic matter, clay, extractable Al, cation exchange capacity, and pH on the adsorption of picloram (4-amino-3,5,6-trichloropicolinic acid) from aqueous and surfactant solutions were investigated. Linear adsorption isotherms for the soils were obtained with the Freundlich equation. Of the five soil properties investigated, Freundlich K values correlated with extractable Al and clay content. Picloram adsorption from aqueous was greater on the soils at pH 5 than at pH 7. The anionic surfactant competed with picloram for adsorption sites on the soils at pH 5. Picloram adsorption from solutions containing 0.1 and 1% cationic surfactant was greater than that from aqueous and anionic and nonionic surfactant solutions. Picloram adsorption from the 10% cationic surfactant solution was similar on soils with pH 5 and 7 and increased with decreased organic matter content. (Author abstract by permission)

77-0788. Khan, S. U.; Marriage, P. B.; Saidak, W. J. (Sci. Chem. Biol. Res. Inst. Agric. Canada, Ottawa, Ontario). **Persistence and movement of diuron and 3,4-dichloroaniline in an orchard soil.** *Weed Sci.* 24(6): 583-586; 1976. (15 references)

The movement and persistence of diuron [3-(3,4-dichlorophenyl)- 1,1-dimethylurea] and its degradation

product, 3,4-DCA (3,4-dichloraniline) were studied in an orchard soil which had received diuron annually at the rate of 4.5 kg/ha for 7 yr. Accumulation of residues was not observed at significant levels although carry-over of the herbicide occurred between years. The bulk of the herbicide residue was confined to the upper 15 cm of soil. The degradation rate of diuron generally followed first-order kinetics and the residual levels of diuron in the soil were highly phytotoxic to oat (*Avena sativa* L.) plants during the 3 yr after the last application. The levels of 3,4-DCA were low in all soil samples (> 21 ppb) and its relative distribution in the soil profile was similar to that of diuron. (Author abstract by permission)

77-0789. Wu, C. H.; Santelmann, P. W. (Agron. Dep., Oklahama State Univ., Stillwater, OK). **Phytotoxicity and soil activity of HOE 23408.** *Wees Sci.* 24(6): 601-604; 1976. (13 references)

Greenhouse and field studies were conducted to compared to phytotoxicity of HOE 23408 (methyl 2-[2,4-dichlorophenoxy) phenoxy]- propanoate) to several crops and annual grass weeds, and to determine the herbicides's soil mobility and persistence. In general, the order of susceptibility of 13 seedling grassy weeds remained constant, whether the herbicide was applied preplant incorporated, preemergence, or postemergence. The herbicide was most phytotoxic when it was applied either preplant incorporated or early postemergence. Grain sorghum [*Sorghum bicolor* (L.) Moench 'BR-54'] and oats (*Avena sativa* L. 'Cimarron') were moderately susceptible to HOE 23408, whereas barley (*Hordeum vulgare* L. 'Will') exhibited marginal tolerance. Wheat (*Triticum aestivum* L. 'Triumph 64') and cotton (*Gossypium hirsutum* L. 'Westburn 70') showed tolerance to HOE 23408 at rates up to 6 ppmw, and soybean [*Glycine max* (L.) Merr. 'Bragg'] and peanut (*Arachis hypogaea* L. 'Spanhoma') demonstrated tolerance to concentrations at high as 24 ppmw. The soil mobility of HOE 23408 was similar to that of trifluralin (α,α,α-trifluoro- 2,6-dinitro- *N,N*-dipropyl-*p*-toluidine). No soil phytotoxicity was found 8 weeks after herbicide application in the field or under laboratory incubation conditions of 5 or 10% soil moisture at 21 C. Dissipation was much slower at a temperature of 4.4 C, regardless of the soil moisture level. (Author abstract by permission)

77-0790. Libik, A. W.; Romanowski, R. R. (Dep. Hort., Purdue Univ., Lafayette, IN). **Soil persistence of atrazine and cyanazine.** *Weed Sci.* 24(6): 627-629; 1976. (15 references)

The persistence of atrazine [2-chloro-4-(ethylamino)- 6-(isopropylamino)- *s*-triazine] and cyanazine 2-[[4-chloro- 6-(ethylamino)-*s*- triazin-2-yl] amino]-2- methylpropionitrile) both applied at 2.24 and 4.48 kg/ha was studied in the field on two soils. A greenhouse bioassay using cucumber (*Cucumis sativus* L. 'Wisconsin SMR-18') showed no reduction in growth when plants were grown in soil taken from cyanazine and atrazine treatments at the end of the season. Similarly, fall-sown rye (*Secale cereale* L.) was not injured. The yields of transplanted tomatoes (*Lycopersicum esculentum* L. 'Campbell 28') and transplanted watermelons (*Citrullus vulgaris* 'Crimson Sweet') were not significantly reduced when grown 1 yr after the initial application of either herbicide. (Author abstract by permission)

77-0791. Savage, K. E. (South. Weed Sci. Lab., Agric. Res. Serv., U.S. Dep. Agric., Stoneville, MS). **Metribuzin persistence in soil.** *Weed Sci.* 25(1): 55-59; 1977. (3 references)

The persistence of metribuzin [4-amino-6-*tert*-butyl-3- (methylthio)- *as*-triazine- 5(4H)-one] in several soils from the lower alluvial floodplain of the Mississippi River was studied in the greenhouse and laboratory using bioassay and gas chromatographic methods of residue detection. Bioassay results indicated that metribuzin phytotoxicity was lost in several soil types within a few weeks of application. Longevity of phytotoxicity depended upon soil type. However soil type had little effect on the rate of metribuzin degradation measured chemically. Gas chromatographic techniques indicated that metribuzin degradation followed first-order kinetics with half-life values ranging from 17 to 28 days in six soils under greenhouse conditions. Incubation studies indicated that metribuzin was degraded more rapidly in nonautoclaved field soil and in soil enriched with glucose than in soil that had been air dry for 1 yr or had been autoclaved. Degradation was more rapid at 30 C than at 20 C. Microbiological activity apparently is important in the degradation of metribuzin in soil. (Author abstract by permission)

77-0792. Fadayomi, O.; Warren, G. F. (Dep. Plant Sci., Univ. Ife, Ile-Ife, Nigeria). **Adsorption, desorption, and leaching of nitrofen and oxyfluorfen.** *Weed Sci.* 25(2): 97-100; 1977. (17 references)

The adsorption of nitrofen (2,4-dichlorophenyl-*p*-nitrophenyl ether) and oxyfluorfen [2-chloro-1- (3-ethoxy-4-nitrophenoxy)- 4-(trifluoromethyl) benzene] from aqueous solution by muck soil, and by kaolinite and bentonite saturated with hydrogen or calcium ions, was studied using ^{14}C-labeled herbicides. Both compounds were readily adsorbed from solution by muck soil and Ca- and H-Al-bentonite but only slightly by Ca- and H-Al-kaolinite. Very little of the adsorbed compounds was desorbed after four extractions with distilled water. A bioactivity study using sorghum seedlings (*Sorghum bicolor* L. 'RS610') was conducted with the herbicides in a silica sand medium amended with 1% (w/w) of the various adsorbents. The herbicides were strongly inactivated by muck soil but there was very little inactivation by the clays. There was essentially no movement of either herbicide through 5-cm columns of a silt loam soil and a fine sand soil. (Author abstract by permission)

77-0793. Grover, R. (Herbic. Behav. Environ. Sect., Res. Stn. Agric. Canada, Regina, Saskatchewan, Canada). **Mobility of dicamba, picloram and 2,4-D in soil columns.** *Weed Sci.* 25(2): 159-162; 1977. (18 references)

The movement of dicamba (3,6-dichloro- *o*-anisic acid), picloram (4-amino- 3,5,6-trichloropicolinic acid), and 2,4-D [(2,4-dichlorophenoxy) acetic acid] was studied in five Canadian prairie soils using soil columns. The three acid herbicides showed the following general order of decreasing mobility in the five soils: Asquith sandy loam > Indian Head loam > Regina heavy clay > Weyburn Oxbow loam > Melfort loam, thus indicating an inverse relationship between adsorption and mobility. In general, the distribution coefficients (kd) were comparable to the corresponding Freundlich constants (k) and these were significantly related to the soil organic matter content, to a lesser extent to soil pH, and not correlated with soil clay content. The maximum concentrations of all three herbicides in the column effluents were well below their respective water solubilities and were inversely related to the distribution coefficients. The calculated values for the amounts of precipitation required to leach the three herbicides to a depth of 10 cm showed the following order of mobility: dicamba > picloram > 2,4-D. (Author abstract by permission)

77-0794. Chang, S. S.; Stritzke, J. F. (Dep. Agron., Oklahoma State Univ., Stillwater, OK). **Sorption, movement, and dissipation of tebuthiuron in soils.** *Weed Sci.* 25(2): 184-187; 1977. (9 references)

Adsorption of tebuthiuron *N*-[5-(1,1-dimethylethyl)- 1,3,4-thiadiazol- 2-yl]-*N,N'*- dimethylurea appeared to be related to organic matter and clay content. After six successive desorption extractions, 40% organic matter but less than 1% was adsorbed in soil with 0.3% organic matter. Differences in adsorption were also reflected in the activity of tebuthiuron on soybeans [*Glycine max* (L.) Merr.] and corn (*Zea mays* L.) where it took 4.9 and 9.5 times as much tebuthiuron, respectively in soil with the greater adsorption to reduce growth by 50%. Soil mobility of tebuthiuron was identical to fluometuron [1,1-dimethyl- 3- (α,α,α-trifluoro-*m*-tolyl), urea] in three soils tested. Soil mobility of herbicides was greater in soil with lower organic matter and low clay content. Both temperature and soil moisture had an effect on persistence of tebuthiuron. Greater dissipation occurred at 15% soil moisture and 30 C than at lower moisture and temperature levels. (Author abstract by permission)

77-0795. Wauchope, R. D.; Chandler, J. M.; Savage, K. E. (Southern Weed Sci. Lab., Agric. Res. Serv., U.S. Dep. Agric., Stoneville, MS). **Soil sample variation and herbicide incorporation uniformity.** *Weed Sci.* 25(2): 193-196; 1977. (12 references)

Copper sulfate ($CuSO_4 \cdot 5H_2O$) was used as a tracer to determine soil sample variation and the effects of incorporation and seedbed preparation practices on the horizontal distribution of broadcast herbicide sprays. A Dubbs very fine sandy loam soil was sprayed with 14.1 kg/ha copper (as $CuSO_4$ solution) and 19 mm diameter soil core samples were taken to a depth of 15 cm after spraying, after single or double disk-harrow incorporation, and after incorporation followed by bedding and row leveling. Cores were systematically located along and across the center two rows of the plots and numbered according to position. Soil cores were weighed, extracted with 0.05 M Na_2 EDTA, and the extract was analyzed by atomic absorption spectrophotometry. For all samples, cores had a range of copper between 50 and 1000 μg, with a coefficient of variation of 47%. Disk-harrow incorporation decreased the copper found in the center of the harrow path by nearly 50%. Bedding followed by row leveling did not change the tracer content of cores but decreased soil core densities. Disk-harrow incorporation may redistribute a herbicide that is initially applied evenly, producing areas of poor weed control and/or crop damage. This observation was confirmed in a field bioassay using trifluralin (α,α,α-trifluoro- 2,6-dinitro- *N,N*-dipropyl- *p*-toluidine) and wheat (*Triticum aestivum* L. 'Coker 6815'). (Author abstract by permission)

77-0796. Ogata, H.; Saito, E.; Murata, H.; Shibazaki, T.; Inoue, T. (Natl. Inst. Hygienic Sci., 18-1, Kamiyoga 1-chome, Setagaya-ku, Tokyo, 158, Japan). **Stability of *O,O*-dimethyl 2,2-dichlorovinyl phosphate in oil preparation.** *Yakugaku Zasshi (J. Pharm. Soc. Jap.)* 96(4): 434-439; 1976. (4 references)

The stability of DDVP (dichlorvos) in oil preparations was examined at 70°, 110°, 130°, and 150°. DDVP was degraded at these temperatures to the aldehyde compound with the reaction following a sigmoid curve against standing time. From Arrhenius plots, the induction time for DDVP degradation at 20° was estimated to be about 17 years. Fenitrothion, baytex (fenthion), pynamin, and piperonyl butoxide did not significantly affect the stability of DDVP. The degradation rate of DDVP in oil was increased by kerosines with impurities and emulsifiers, especially anionic emulsifiers, while cresol inhibited the degradation.

77-0797. Thielemann, H. (Hyg.-Inst. Martin-Luther-Univ. Halle-Wittenberg, Lehrst. Allg. Kommun. Hyg., Halle, DDR). **Experimentelle Untersuchungen zur Kontamination von Eiern mit chlorierten Kohlenwasserstoffen. [Experimental studies on the contamination of eggs with chlorinated hydrocarbons.]** *Z. Ges. Hyg. Ihre Grenzgebiete* 22(6): 457-459; 1976. (1 reference) (German)

Hen's eggs and duck's eggs collected from small farms and cooperative farms in different areas of East Germany during 1974 were analyzed thin-layer chromatographically for residues of DDT+DDE and of other organochlorine pesticides. One hundred and seventy-two hen's eggs were investigated; 125 were free from DDT (DDE) residues, 32 contained DDT residues

below the maximum allowable level of 0.3 ppm; 13 contained 0.3-0.5 ppm, two contained over 0.5 ppm. Traces of lindane were found in some eggs. The DDT (DDE) levels were below 0.3 ppm in duck's eggs. The results show a considerable reduction in the contamination of eggs from the previous years, which is attributed to the administrative steps to curtail or stop the use of DDT in East Germany.

see also **77-0887** **77-0894** **77-0963**

77-0798. Copplestone, J. F.; Fakhri, Z. I.; Miles, J. W.; Mitchell, C. A.; Osman, Y.; Wolfe, H. R. (Vector Biol. Control., World Health Organ., Geneva, Switzerland). **Exposure to pesticides in agriculture: a survey of spraymen using dimethoate in the Sudan.** *Bull. WHO* 54(2): 217-224; 1976. (4 references)

There is a need for objective data on the exposure of spraymen to pesticides in agriculture in order to assess minimum requirements for practicable protection in tropical areas. To provide data, a survey was carried out in the Sudan on spraymen using dimethoate. No cholinesterase depressions were found and the calculated dose received by each man per day was within safe limits in the circumstances of this survey. Respiratory exposure was only a minor part of total exposure. The methodology of such surveys is discussed and the need for the use of a standard protocol is emphasized. (Author abstract by permission)

77-0799. Wolf, A. F. (Author address not given). **Occupational lung disease. Part 3 - Conditions caused by noxious gases.** *Consultant* 17(2): 205-206, 209-210; 1977.

Among the numerous gases which can produce respiratory disease are nitrogen dioxide, sulfur dioxide, carbon tetrachloride, toluene diisocyanate, polymer fumes, cadmium, zinc, and mercury fumes, metallic silicide, manganese oxide, nickel, perchloroethylene, smoke, and insecticides. Toxaphene can cause bilateral bronchopneumonia if absorbed through the skin or inhaled. The illness may last only a few days, but the patient's x-ray films may not clear for several weeks. Parathion can also be toxic to humans. If inhaled or absorbed through the skin, it can produce pulmonary edema, muscle twitching, and marked weakness of the skeletal muscles. Parathion acts by inhibiting acetylcholinesterase and the antidote to parathion poisoning is atropine.

77-0800. Ecobichon, D. J.; Ozere, R. L.; Reid, E.; Crocker, J. F. S. (Dep. Pharmacol., Fac. Med., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Acute fenitrothion poisoning.** *Can. Med. Assoc. J.* 116(4): 377-379; 1977. (28 references)

A technician was accidentally exposed to the organophosphorus insecticide fenitrothion and subsequently treated with pralidoxime for the autonomic, somatic and psychiatric manifestations of intoxication. Although long-term therapy with pralidoxime is not recommended, this patient required and obtained symptomatic benefit from its prolonged use. Erythrocytic and plasma cholinesterase activities had been monitored prior to exposure and were monitored throughout treatment and following recovery. Continual monitoring of cholinesterase activities of individuals occupationally exposed to organophosphorus ester insecticides and early diagnosis are essential.

77-0801. Gilbertson, M.; Fox, G. A. (Toxic Chem. Div., Can. Wildl. Serv., Ottawa, Ontario, Canada K1A OH3). **Pollutant-associated embryonic mortality of Great Lakes herring gulls.** *Environ. Pollut.* 12(3): 211-216; 1977. (17 references)

Many embryos in recent nestings of herring gulls on Lake Ontario died prior to hatching. Signs associated with this embryonic mortality include enlarged livers, reduced embryo size, porphyria and accumulations of a subcutaneous muco-serous fluid in some embryos. These signs may be related to the widespread organochlorine pollutants DDE, dieldrin, hexachlorobenzene and PCBs.

77-0802. Gumennyi, V. S.; Tkach, L. I. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic., Polym. Plast. Mater., Kiev, USSR). **Nekotorye osobennosti rasprostranennosti zabolevanii serdechno-sosudistoi sistemy i organov dykhaniia y zonakh intensivnogo i ogranichennogo primeneniia pestitsidov (po dannym meditsinskikh osmotrov). [Findings on incidence of diseases of the cardiovascular system and respiratory organs in areas with intense and limited use of pesticides (based on miedical examination data).]** *Gig. Sanit.* (5): 114; 1976. (Russian)

The incidence of diseases of the respiratory organs and cardiovascular system was studied on the basis of medical examination data in a population living in a zone with intense pesticide use (zone 1) and in another population living in the zone (zone 2) in which the amount of pesticides used is one ninth of that used in zone 1. The incidence of chronic respiratory diseases was higher in zone 1 than in zone 2 for all age groups, but the difference was significant only for the age bracket 25-34 yr, for which the incidence was 1.7 times as high in zone 1 as in zone 2. The difference was especially high for asthmatic bronchitis (300%) and chronic bronchitis (250%). The incidence of cardiovascular diseases was twice as high in zone 1 as in zone 2; the incidence of the 15-24 yr age group was twice as high in zone 1 as in zone 2. The findings suggest an influence of intense pesticide use on the incidence of respiratory and cardiovascular diseases.

77-0803. Mal'tseva, L. M.; Savvaitova, N. I.; Chemnyi, A. B. (M. F. Vladimirskii Oblast Clin. Inst., Moscow, USSR). **Ob ostrom otravlenii karbotionom. [Acute poisoning by carbothion.]** *Gig. Tr. Prof. Zabol.* 7: 53-54; 1976. (5 references) (Russian)

Two of eight female workers developed acute poisoning by carbothion (metham-sodium) a few hours after the start on the workday while applying this preparation in a hothouse. While all individual safety rules were complied with, the concentration of the solution applied was higher than permissible (5% instead of 3%). One patient, aged 30 yr, developed pruritus, urticaria, and frequent headaches. The EEG showed reduced alpha-wave activity, low-frequency beta waves, and episodic discharges of bilateral synchronous theta waves. Desensitization andymptoms of poisoning in another 34-year-old women with vegetative-vascular dystonia in her history. Lability of the arterial pressure and pulse, moderate

miosis, dermatographia, vegetative vascular crises, slight sinistral ptosis and nystagmus, slight asymmetry of the tendon reflex, marked reduction of the abdominal reflexes, and slight dyscoordination of motions were observed. The health status of the patient largely normalized in 3 months. These poisonings suggest that the protective devices may have been defective.

77-0804. Lee, B.; Groth, P.; Turner, W. (Food and Drug Admin., Rockville, MD). **Suspected reactions to gamma benzene hexachloride.** *J. Am. Med. Assoc.* 236(25): 2846; 1976. (2 references)

Although gamma benzene hexachloride (lindane) is approved by the FDA for use in the eradication of scabies and head lice, reports received by the FDA suggest the need to avoid high doses and prolonged contact in the use of this drug. CNS toxicity is a prominent feature of acute toxicity studies in animals and suspected CNS toxicity has been reported in humans. The incidence of adverse reactions following use of the manufacturer's recommended use of gamma benzene hexachloride is not well established, but the therapeutic use of this drug should be closely monitored and patients should be warned to report to their physician any unusual effects occurring after application of the drug. The FDA will continue to serve the role of a central registry and urges physicians to report all suspected cases of adverse reactions to products containing gamma benzene hexachloride. Information on drug usage, adverse reactions, and other drug experience is available to qualified health practitioners on individual request.

77-0805. Atabaev, Sh. T.; Katsenovich, L. A. (No affiliation given). **Profilaktika otravlenii yadokhimikatami pri ikh primenenii v sel'skom khoziaistve.** [**Preventing agricultural pesticide poisoning.**] *Med. Zh. Uzbek.* 11: 3-7; 1975. (Russian)

General safety rules are described concerning the handling and agricultural use of pesticides. Persons aged under 18 years, pregnant and lactating women, and persons in impaired health status are not permitted to occupationally handle or distribute agricultural pesticides. Thorough medical examination is required before employment, and regular medical check-ups are required during employment. The use of protective clothing and of individual means of protection is required. Smoking and eating during work with pesticides are forbidden. The workday is limited to 6 hr, and, in the case of high toxicity preparations, to 4 hr. As a result of the implementation of the above rules in Uzbekistan, the incidence of job-related poisonings by pesticides has dropped considerably. Most poisonings are due to organochlorine and organophosphorus pesticides.

77-0806. Vale, J. A. (Poisons Unit, Guy's Hosp., London, England). **Paraquat poisoning.** *Nursing Times* 73(5): 154-155; 1977. (1 reference)

In its concentrated form, paraquat has a strong irritant action on various types of epithelia and oral ingestion of the pesticide will lead to respiratory, renal, hepatic, and cardiac damage. Pulmonary involvement may occur up to 6 wk after the ingestion of paraquat. The local toxic effects of paraquat should be treated by washing with soap and water and copious irrigation if the eyes are involved. Systemic paraquat poisoning may be treated by elimination of the herbicide from the gut before absorption had taken place, elimination of the poison from the body after its absorption, and the use of antidotal agents. Use of a Fuller's earth/megnesium sulfate mixture after gastric lavage has been performed has proven to be of value. No substance is known to have an antidotal effect in paraquat poisoning and at present there is no known treatment for patients who have ingested a large overdose of the herbicide. Two patients are described, one of who ingested a massive overdose and died within a few hours from multiple organ failure, and one of whom succumbed after 19 days from respiratory failure.

77-0807. Fairshter, R. D.; Rosen, S. M.; Smith, W. R.; Flauser, F. L.; McRae, D. M.; Wilson, A. F. (Dep. Med. Pathol., Univ. California, Irvine, CA 92664). **Paraquat poisoning: new aspects of therapy.** *Q. J. Med.* 45(180): 551-565; 1976. (57 references)

Clinical, laboratory, and pulmonary physiologic features of three fatal cases of paraquat poisoning are presented. Experimental investigations and clinical experience would suggest several possible means of modifying paraquat toxicity. The following specific therapeutic interventions, several of which had previously been applied only in experimental circumstances, were used: (1) inhibition of absorption of paraquat with Fuller's earth and catharsis by magnesium sulfate, (2) elimination of absorbed paraquat by hemodialysis with ultrafiltration and forced diuresis, (3) competition by *d*-propranolol for tissue binding sites, (4) modification of direct pulmonary tissue effects of paraquat by hypoxic breathing mixtures, superoxide dismutase, and corticosteroids. Treatment was unsuccessful in these cases but the clinical experience and data accumulated concerning paraquat concentration in body and dialysis fluids suggest a therapeutic approach aimed at preventing early and progressive tissue damage. A combination of Fuller's earth and magnesium sulphate should be used immediately and in frequently repeated doses to prevent absorption. Diuresis and hemodialysis should be instituted as soon as possible to increase excretion. Hypoxic atmospheres should be created urgently to produce a PaO_2 of 40-45 mmHg, and the use of superoxide dismutase be further investigated. It is hoped that the high mortality of paraquat poisoning will be modified by this combined approach of early and intensive treatment.

77-0808. Anonymous. **Safety precautions with the use of herbicides.** *Rail Internatl.* 7(9): 531-532; 1976.

Various chemical herbicides are used along railway tracts to ensure the removal of plant growth on and around the tracks, thus enabling the trains to move more efficiently. Various precautions should be exercised in the use of personnel to apply these sprays. It is not advisable to use women of child-bearing age. Employers must not eat, drink or smoke while spraying is being performed; meticulous washing after the shift is required, with a shower if at all possible; immediate washing if the skin comes in contact with the chemical; and a required visit to the railway doctor if a person suspects he may have been affected during the spraying season. Working clothes must be tight fitting around the neck and wrists. High leather boots must be worn under the trousers and a waterproof cap or helmet must also be worn. Herbicides containing 2,4,5-T can only be used when the manufacturer presents an institute authorized certificate that there is no more than 0.1 ppm dioxin in the mixture. Contact with fire is to be avoided.

77-0809. Carlson, S. (Inst. Wasser-, Boden- Lufthyg. Bundesgesundheitsamtes, 1 Berlin 33, Germany). **Die Begrenzung von Wasserinhaltsstoffen in Empfehlungen, Standards und Normen der Weltgesundheitsorganisation und verschiedener Laender.** [**The limit of water contaminants in recommendations, standards and norms of the World Health Organization and various countries.**] *Schriftenr. Ver. Wasser Boden Lufthyg.* (40): 209-219; 1973. (25 references) (German)

WHO International and European Standard concerning pollutants such as metals, halogen compounds, cyanides, nitrates, sulfates, and phenols in drinking-water, and standards in various countries of the world are presented. Research is being conducted to assess the environmental impact of herbicides, and to find ways to curtail the use of pesticides.

77-0810. Gehlbach, S. H.; Williams, W. A. (P. O. Box 2091, Raleigh, NC). **Pediatric pesticide poisonings in North Carolina:epidemiologic observations.** *South Med. J.* 70(1): 12-14; 1977. (5 references)

In four years 218 pesticide exposures were reported among North Carolina children. Epidemiologic follow-up revealed 50 symptomatic cases with nine fatalities. Mean age of exposed children was 27 months; boys were involved twice as frequently as girls. Agents most often implicated were anticoagulant rodenticides (17%) and organophosphate insecticides (16%). Sixty-eight percent of exposures were to products intended for household use. Special characteristics of pesticides that contribute to morbidity include exceptional toxicity, dermal penetration, and frequent application as food baits. Exposure histories indicate that high petroleum distillate content often adds to product toxicity.

77-0811. Musiichuk, Yu. I.; Nagornyi, S. V.; Filicheva, A. P. (Author address not given). **Klinika, diagnostika i ekspertiza trudosposobnosti pri khronicheskoi intoksikatsii khlorofosm.** [**Clinical, diagnostic, and legal aspects of chronic trichlorfon intoxication.**] *Ter. Arkh.* 48(3): 154; 1976. (Russian)

Results of clinical examinations of 30 patients aged 30-45 years, who had been engaged in trichlorfon production for 1-3 years, are presented. The trichlorfon concentrations in the air were in a range of 0.2-4.83 mg/m^3 against a MAC value of 0.5 mg/m^3. The trichlorfon concentration on the skin of the workers was 0.41-0.88 mg/dm^2. Most patients complained of headache, fatigability, disposition to sweat, pain and paresthesia in the limbs, tremor of the muscles of the limbs, and dyspnea. These symptoms were most pronounced a few hours after the shift. Reduced cholinesterase and acetylcholinesterase activities were measured. Initial stage of chronic poisoning was diagnosed in 10 patients, pronounced chronic poisoning in 20.

77-0812. Zhizhonkov, N. V. (Munic. Cent. First Aid Emerg. Med. Aid, Kremenchug, USSR). **Ostroe otravlenie dikhloretanom.** [**Acute poisoning by dichloroethane.**] *Vrach. Delo* (6): 127-128; 1976. (Russian)

A case of acute accidental poisoning by dichloroethane in a 43-year-old man is reported. The patient, being aware of having drunk up to 30 ml of dichloroethane instead of vodka, induced emesis and performed gastric lavage. A slight vertigo made him seek medical assistance about 4 hours later. Treatment with charcoal, glucose infusion, ascorbic acid, cocarboxylase, vitamin B_6, and panangin and failed to prevent aggravation. Absence of tendon reflex, clonic and tetanic spasms, serious tachycardia developed overnight. The patient died in one day with signs of greatly reduced cardiac activity.

77-0813. Anonymous. **Parathion poisoning.** *W.I. Med. J.* 25(1): 1-2; 1976.

Thousands of humans have died from parathion poisoning following the consumption of contaminated flour or barley, accidental ingestion of the pesticide itself, external application for body lice, fleas, or skin diseases, contact with contaminated clothing, and intentional suicidal ingestion. Malathion, which is of comparatively low toxicity, has also been responsible for a substantial number of deaths. The clinical manifestations of acute parathion poisoning in man result from the initial stimulation and subsequent blocking of cholinergic transmission to the acetylcholinesterase inhibition. The prognosis is good in latent poisoning, in which the patient is able to walk and the cholinesterase activity is 20-50% of the normal value. Treatment with pralidoxime and atropine sulfate is generally successful in moderate poisoning (cholinesterase activity = 10-20% of normal value), but the prognosis is poor in severe poisoning (cholinesterase activ-

ity less than 10% of normal value). Untreated patients who live for more than 24 hr will recover whereas patients under treatment may succumb up to 1 wk after the onset of symptoms.

see also **77-0762**

77-0814. Gupta, P. K.; Paul, B. S.; Ehrnebo, M. (Dept. Pharmacol., Punjab Agric. Univ., Ludhiana, India). **Absorption and elimination kinetics of ^{32}P malathion in the hen.** *Acta Pharmacol. Toxicol* 40(1): 65-69; 1977. (4 references)

A method for the separation of urine and feces in the hen was developed, and the biological fate of ^{32}P malathion was studied following a single oral dose of 262.40 mg/kg body weight. The results suggested that the compound was rapidly absorbed from the gastrointestinal tract; significant quantities being detected in the plasma and whole blood 1/2 hr after ingestion. Total ^{32}P was eliminated in the urine by apparent first order kinetics with an average half-life of 5.7 hrs. The cumulative urinary and fecal data revealed that 93% of the ^{32}P is excreted via the urine within 48 hrs, thus indicating that the compound is almost completely absorbed. It is therefore concluded that accumulation in the system is unlikely.

77-0815. Sudakhar-Barik; Siddaramappa, R.; Sethunathan, N. (Lab. Soil Microbiol., Cent. Rice Res. Inst., Cuttack-6, Orissa, India). **Metabolism of nitrophenols by bacteria isolated from parathion-amended flooded soil.** *Antonie van Leeuwenhoek J. Microbiol. Serol.* 42: 461-470; 1976. (11 references)

Two bacterial isolates from parathion-amended flooded soil, *Pseudomonas* sp. and *Bacillus* sp., were examined for their ability to decompose nitrophenols. Uniformly labelled ^{14}C-*p*-nitrophenol was metabolized by both bacteria, $^{14}CO_2$ and nitrite being end products. A substantial portion (23% for *Pseudomonas* sp. and 80% for *Bacillus* sp.) of radioactivity applied as *p*-nitrophenol was accounted for as $^{14}CO_2$ at the end of a 72-h period; 8 to 16% remained in the water phase after solvent extraction. *Pseudomonas* sp. produced nitrite also from 2,4-dinitrophenol, but only after a lag, and not from *o*- and *m*-nitrophenols. Interestingly, *m*-nitrophenol, known for its resistance to biodegradation because of *meta* substitution, was decomposed by *Bacillus* sp., resulting in the formation of nitrite and phenol; *o*-nitrophenol and 2,4-dinitrophenol resisted degradation by this bacterium.

77-0816. Stafford, D. P.; Plapp, F. W.; Fleet, R. R. (Dep. Entomol., Texas A & M Univ., College Station, TX). **Snakes as indicators of environmental contamination: relation of detoxifying enzymes and pesticide residues to species occurrence in three aquatic ecosystems.** *Arch. Environ. Contam. Toxicol.* 5(1): 15-27; 1976. (18 references)

Pesticide detoxifying enzymes and residues of *p,p'*-DDE and PCB were measured in snakes of two genera collected in three aquatic ecosystems in central Texas. Snake genera were *Agkistrodon* (water moccasins and copperheads) and *Natrix* (water snakes). One collecting site had heavy exposure to insecticides, one to PCBs and one to neither. Objectives were to correlate pesticide residues and detoxifying enzymes with species occurrence in different ecosystems, to evaluate the usefulness of snakes as indicators of environmental contamination, and to establish a biochemical basis for the differential distribution of snakes between ecosystems. *Agkistrodon* spp. had several times the NADPH-dependent oxidative detoxifying activity of *Natrix* spp. Within *Natrix*, oxidase activity was significantly higher in *erythrogaster* and *fasciata* than in *rhombifera*. Alkyltransferase activity was higher in *A. piscivorus* (water moccasins) than in any other species. There were no consistent differences between sexes in levels of detoxifying enzymes and enzyme activity was similar in snakes of each species from all collecting sites, indicating no induction had occurred as a result of heavy exposure to insecticides or PCBs. DDE residues were highest in snakes collected adjacent to a cotton agro-ecosystem. PCB residues occurred only in snakes collected near occurred only in snakes collected near a heavily-traveled highway. Residues in *A. piscivorus* were only half those in *Natrix* spp. from the same site, indicating the former is more efficient at disposing of residues. The data indicate that snakes with high levels of detoxifying enzymes, particularly microsomal oxidases, are more likely to occur in a contaminated ecosystem than snakes with less active detoxifying enzymes and that residues are lower in the better detoxifiers. Snakes are apparently excellent indicators of environmental contamination by insecticides and other persistent chemicals. (Author abstract by permission)

77-0817. Sharma, R. P.; Winn, D. S.; Low, J. B. (Toxicol. Program, Utah State Univ., Logan, UT). **Toxic, neurochemical and behavioral effects of dieldrin exposure in mallard ducks.** *Arch. Environ. Contam. Toxicol.* 5(1): 43-53; 1976. (23 references)

Toxic, neurochemical and behavioral alterations were evaluated in ducks fed various dietary levels of dieldrin. Increasing amounts of dieldrin in the diet caused an appreciable decrease in the levels of three biogenic amines in whole brain, *i.e.* serotonin, norepinephrine and dopamine. No effect was noted in whole brain gamma aminobutyric acid contents. Hepatic microsomal enzymes were assayed in these birds using *p*-nitroanisol and *O*-ethyl-*O*-*p*-nitrophenyl benzenethionophosphate as substrates. Sublethal amounts of dieldrin caused an increase in hepatic drug metabolizing enzymes. Similar alterations were noted in liver protein, deoxyribonucleic acid and ribonucleic acid contents. Studies involving encounters between mallard drakes indicated a decline in the tendency for dieldrin exposed drakes to take the initiative and establish rights of access in approach confrontations. Although many of these changes are compatible with life processes, their significance is not well understood, especially in terms of lifelong exposure to persistent pesticides. The possible relationship between neurochemical alterations and the mechanisms of insecticide neurotoxicity is discussed. (Author abstract by permission)

77-0818. Chkanikov, D. I.; Makeyev, A. M.; Pavlova, N. N.; Grigoryeva, L. V.; Dubovoi, D. P.; Klimov, O. V.

(All-Union Inst. Phytopathol., Moscow Region, USSR). **Variety of 2,4-D metabolic pathways in plants; its significance in developing analytical methods for herbicides residues.** *Arch. Environ. Contam. Toxicol.* 5(1): 97-103; 1976. (7 references)

The 2,4-D in plants very rapidly undergoes various transformations and its predominant metabolic pathways and rates vary with different plant species. In bean and soybean plants major 2,4-D metabolities are 4-*O*-β-D-glucosides of 4-hydroxy-2,5-dichloro- and 4-hydroxy -2,3-dichloro-phenoxy-acetic acids; in addition, considerable amounts of *N*-(2,4-dichlorophenoxyacetyl) -L- aspartic and *N*-(2,4-dichlorophenoxyacetyl) -L- glutamic acids are accumulating in them. Among 2,4-D metabolites in cereals there prevailed 1-*O*-(2,4-dichlorophenoxyacetyl)- β-D-glucose while the glycoside of 2,4-dichlorophenol prevailed in strawberry plants. (Author abstract by permission)

77-0819. Schulte-Hermann, R. (Inst. Toxikol. Pharmakol. Philipps-Universitaet, Marburg, Germany). **Fuetterungs-rhythmen und die circadianen Variationen der Zellproliferation bei pharmakologisch induziertem Leberwachstum. [Feeding rhythms and the diurnal rhythm of cell proliferation in pharmacologically induced liver cell growth.]** *Arch. Toxicol.* 36(3/4): 235-245; 1976. (15 references)

Stimulation of hepatic DNA synthesis can be achieved in the intact rat by α-hexachlorocyclohexane (α-BHC, = α-benzene hexachloride). The extent of stimulation is high in the morning and low in the evening. These rhythmic variations in the rate of DNA synthesis are synchronized indirectly by the light-dark rhythm, but directly by the animals' feedings habits: rats eat preferentially during the night. If the diurnal rhythm of food intake is abolished, the rhythmic fluctuations in the rate of DNA synthesis are no longer detectable; if rats are adapted to daily feeding periods of only 5 h, these fluctuations are pronounced and almost synchronized. Further experiments show that the time of feeding determines the time of DNA replication. It is concluded that food intake provides a "second stimulus" or permissive factor, which is required for the induction of DNA synthesis in a certain critical stage of the prereplicative phase. Labelling experiments with orotic acid suggest that food intake intially induces an increase of RNA synthesis. The results indicate that controlled feeding schedules provide the possibility to synchronize, in the living animal, a proliferating population of hepatocytes. A hypothesis is derived which offers an explanation for the generation of the diurnal rhythm of cell proliferation in the liver. (Author abstract by permission)

77-0820. Muacevic, G. (C. H. Boehringer Sohn, Abt. Pharmakol., Ingelheim am Rhein, Germany). **Acute toxicity and cholinesterase inhibition in vivo of chlorthiophos.** *Arh. Hig. Rada. Toxikol.* 27(1): 3-14; 1976. (11 references)

The acute toxicity of chlorthiophos with a chief component *O,O*-diethyl-*O*- [2,5-dichloro-4- (methylthio) phenyl] thionophosphate, combined with *O,O*-diethyl-*O*- [4,5-dichloro-2- (methylthio) phenyl] thionophosphate and *O,O*-diethyl-*O*- [2,4-dichloro-5- (methylthio) phenyl] thionophosphate is described. The oral LD_{50} values obtained are: rat, 13 mg/kg; mouse, 141 mg/kg; guinea-pig, 58 mg/kg; rabbit, 20 mg/kg; quail, 45 mg/kg; hen, 45 mg/kg, and dermal LD_{50}: for rat, 58 mg/kg and for rabbit, 48 mg/kg. No signs of neurotoxicity in hens were observed. In rats, a maximal inhibition of erythrocyte cholinesterase was found after two hours, of plasma cholinesterase after four and of brain cholinesterase after six hours, with a reversal to normal in the blood observed after four days and in brain after eight days. Lindane and phenobarbital pretreatment reduced the acute toxicity of chlorthiophos. Atropine and some oximes (obidoxime chloride and trimedoxime bromide) antagonized the toxic effects of chlorthiophos.

77-0821. Jovic, R. C. (Neuropsychiatric Hospital, Kovin, Yugoslavia). **Promene aktivnosti acetilholinesteraze u kori mozga miseva trovanih sa NX otrovom i izlozenim produzenom dejstvu hiperoksicne sredine. [Brain cholinesterase activity changes in mice treated with *O*-ethyl-*S*- (2-diisopropyl-aminoethyl) methyl phiophosphonate (VX) and exposed to high oxygen concentrations in the air.]** *Arh. Hig. Rada Toksikol.* 27(1): 15-22; 1976. (6 references) (Serbo-Croatian)

The effect of the length of exposure to high oxygen concentrations on acetylcholinesterase activity has been studied in the cortical slices of normal and VX poisoned mice. An 8-hour exposure had no effect on enzyme activity in either group of mice, regardless of whether they were protected with oximes or not. However, the mice exposed to high oxygen concentrations for 15 to 30 days showed a considerably higher AChE activity as compared with controls. This was clearly shown even in intact mice whose brain cholinesterase activity was 10 to 40 per cent higher than in intact mice kept in the normal atmosphere. In the mice protected with oximes enzyme reactivation was somewhat faster than in controls. It is concluded that a high oxygen concentration in the breathing air may cause an increased AChE activity in intact animals and stimulate both the spontaneous and oxime induced enzyme reactivation in VX poisoned mice.

77-0822. Brankov, K.; Hadzovic, S.; Erdeljan, D. (Dep. Pharmacol. Toxicol., Vet. Fac., Sarajevo, Yugoslavia). **Efikasnost reaktivatora i spazmolitika nakon otrovanja amitonom in vitro. [Efficacy of reactivators and spasmolytics after amiton poisoning in vitro.]** *Arh. Hig. Rada Toksikol.* 27(29: 123-130; 1976. (10 references) (Serbo-Croatian)

The paper deals with the action of amiton, an organophosphorus cholinesterase inhibitor, some reactivators (morpholinium oxime, Mina and PAM-2 Cl),

methylatropine (a cholinolytic) and papaverine (a spasmolytic) on isolated mouse stomach. Amiton was found to produce a strong spastic effect. The oximes MINA and PAM-2 Cl infused in the vessel for isolated organs after amiton poisoning removed the spasm and returned contractions to their initial values. The functional recovery of the intoxicated organ was permanent and complete. The effect produced by morpholinium oxime was only spasmolytic, probably directly on receptors, and not an indirect, reactivating effect. The spasmolytic effect of this oxime was identical to the effects of methylatropine and papaverine.

77-0823. Boskovic, B.; Vojvodic, V.; Maksimovic, M.; Granov, A.; Besarovic-Lazarev, S.; Binenfeld, Z. (Army Tech. Inst., Belgrade, Yugoslavia). **Effect of mono- and bis-quaternary pyridinium oximes on the acute toxicity and serum cholinesterase inhibiting activity of dioxacarb, carbaryl and carbofuran.** *Arh. Hig. Rada Toksikol.* 27(4): 289-295; 1976. (9 references)

The acute toxicites of insecticidal carbamates (dioxacarb, carbaryl and carbofuran) were determined in mice by s. c. or i. p. injection, both in the absence and in the presence of atropine and several pyridinium oximes. Atropine had a beneficial effect on the toxicity of all the three carbamates, while the oximes varied in their effects. In the case of carbaryl all oximes used increased its toxicity, while in dioxacarb and carbofuran poisoning some of them were effective. It was found that the oximes do not influence the action of carbamates on the activity of serum cholinesterase in vitro in a way which could explain their effect on the toxicity of these compounds. It is concluded that the use of oximes is contraindicated in cases of intoxication with carbaryl, dioxacarb and carbofuran.

77-0824. Pohl, L. R.; Porter, W. R.; Trager, W. F.; Fasco, M. J.; Fenton, J. W. III (Dep. Pharm. Chem., Univ. Wash., Seattle, WA). **Stereochemical biotransformation of warfarin as a probe of the homogeneity and mechanism of microsomal hydroxylases.** *Biochem. Pharmacol.* 26(2): 109-114; 1977. (36 references)

The hepatic microsomal metabolism of *R* and *S* warfarin by normal Wistar and Sprague-Dawley rats was compared with that of phenobarbital (PB) and 3-methylcholanthrene (3-MC)-pretreated animals. In all the microsomal systems examined, *R* warfarin was metabolized faster than the *S* enantiomer. Induction of microsomal mixed-function oxidase activity with PB, and especially 3-MC, caused significant alterations in the normal stereochemical pattern of *R* and *S* warfarin hydroxylation which were independent of the method of microsomal preparation and the technique employed in the quantitation of hydroxylated products. PB pretreatment of Sprague-Dawley rats resulted in an increase in all hydroxylated products but to differing extents. Similar results were obtained from Wistar rats except for the processes of 4′ and benzylic hydroxylation of (*S*) warfarin. 3-MC pretreatment resulted in the selective induction of 6- and 8-hydroxylation in both species. These results suggest that liver microsomes from normal animals contain at least two major, A and B, and two minor, C and D, monooxygenases which differ in their stereoselectivity (as measured by the rates for the formation of two enantiomeric products), regioselectivity (as measured by the ratio of any two isomeric products from the same substrate), and inducibility. In this model, normal animals have hydroxylase activity, enzyme A, which is not inducible by PB or 3-MC and which is stereoselective for the *R* enantiomer of warfarin in 7- and benzylic hydroxylation and for the *S* enantiomer in 4′-hydroxylation. Microsomes from normal and PB-induced animals contain additional hydroxylase activity, enzyme B, which catalyzes both the 6- and 8-hydroxylation of warfarin and which has low stereoselectivity but is regioselective for 6-hydroxylation. Enzyme B may also be responsible for some 4′-hydroxylation. PB-induced animals have additional mono-oxygenase activity, enzyme C, which displays the opposite stereoselectivity compared to enzyme A for benzylic and less stereoselectivity for 7-hydroxylation. 3-MC-induced animals have greatly enhanced levels of 6- and 8-hydroxylase activity, enzyme D, which is stereoselective for the *R* enantiomer and regioselective for 8-hydroxylation of *R* warfarin and 6-hydroxylation of *S* warfarin. (Author abstract by permission)

77-0825. Heinz, G. H. (U.S. Fish Wildlife Serv., Patuxent Wildlife Res. Cent., Laurel, MD 20811). **Behavior of mallard ducklings from parents fed 3 ppm DDE.** *Bull. Environ. Contam. Toxicol.* 16(6): 640-645; 1976. (14 references)

Male and female mallard ducks (*Anas platyrhynchos*) were fed a control diet or a diet containing 3 ppm DDE. Starting 3 mon after the beginning of treatment, eggs were collected daily for 78 days. Some of the eggs were maintained in an incubator and some were analyzed by gas chromatography. The ducks fed 3 ppm DDE laid eggs that contained an average of 5.8 ppm DDE. The ducklings that hatched from these eggs differed from controls in behavioral tests designed to measure responses to a maternal call and to a frightening stimulus. In response to the maternal call, ducklings from parents fed DDE were hyperresponsive; compared to controls, a greater percentage approached the call and a greater percentage of those that approached remained near the call for the remainder of the test. In a test of avoidance behavior, ducklings whose parents were fed DDE traveled shorter distances from the frightening stimulus than did controls.

77-0826. Zitko, V.; Hutzinger, O. (Environ. Canada, Biol. Station, St. Andrews, New Brunswick, Canada EOG 2XO). **Uptake of chloro- and bromobiphenyls, hexachloro- and hexabromobenzene by fish.** *Bull. Environ. Contam.*

Toxicol. 16(6): 665-675; 1976. (7 references)

Juvenile Atlantic salmon (*Salmo salar*) were exposed to various di-, tri-, and tetrabromobiphenyls, the corresponding chlorobiphenyls, and hexabromo- and hexachlorobenzene. The pesticides were added to the food or aquatic environment of the test fish. No major differences between the accumulation of di- and tetra-, bromo- and chlorobiphenyls by fish were apparent. However, in contrast to hexachlorobenzene, hexabromobenzene was not accumulated from either food or water. The concentrations of both chloro- and bromo- substituted compounds in water were of the same order of magnitude, and in both cases, the fish accumulated higher concentrations from the water than from the food. In both groups of compounds, the accumulation coefficients generally decreased with increasing degree of substitution during the uptake from water and increased with increasing degree of substitution when taken up from food. Partially debrominated compounds were not detectable in fish exposed either from water or food, but a dibromobiphenylol was tentatively detected in the former. Mortality after exposure to chlorine occurred among fish fed the mixture of brominated hydrocarbons.

77-0827. Courtney, K. D. (Health Effects Res. Lab., Environ. Protect. Agency, Research Triangle Park, NC 27711). **Mouse teratology studies with chlorodibenzo-*p*-dioxins.** *Bull. Environ. Contam. Toxicol.* 16(6): 674-681; 1976. (10 references)

Various chlorinated dibenzo-*p*-dioxins were administered to female CD-1 mice and pregnant CD-1 mice by stomach intubation or s.c. injection. The compounds were administered for 14 days to the nonpregnant mice and on days 7-16 of gestation to the pregnant mice. None of the compounds tested was as toxic as TCDD, and some of the compounds were virtually nontoxic. A mixture of dichloro- and trichlorodibenzo-*p*-dioxin administered orally at dose of 100-200 mg/kg/day had no adverse effects on fetal or maternal parameters, whereas TCDD (100 mg/kg/day) adversely affected fetal weight and survival and maternal weight gain. TCDD at 200-400 mg/kg/day produced maternal edema and vaginal bleeding with abortion in some cases. Fetal mortality was greater after TCDD administered s.c. than after the same dose administered orally. Octachlorodibenzo-*p*-dioxin (5-20 mg/kg/day) had no significant effects on fetal or maternal parameters. Only TCDD produced a significant increase in fetal malformation; the increase was seen at all dose levels and with both routes of administration.

77-0828. Robertson, E. B.; Bunting, D. L. (Grad. Progr. Ecol., Univ. Tennessee, Knoxville, TN 37916). **The acute toxicity of four herbicides to 0-4 hour nauplii of *Cyclops vernalis* Fisher (Copepoda, Cyclopoida).** *Bull. Environ. Contam. Toxicol.* 16(6): 682-688; 1976. (11 references)

Zero to four hour nauplii of the copepod *Cyclops vernalis* Fisher were exposed to varying concentrations of amitrole, amitrole-T, the free acid of 2,4-D or the alkanolamine salt of 2,4-D in static bioassays. When compared with the published data, *C. vernalis* was found to be among the most sensitive crustaceans when exposed to amitrole-T and the free acid of 2,4-D. This species was somewhat less sensitive to the other two herbicides. The toxicity of the commercial formulations was not dependent on the active ingredient content. Amitrole-T with 20% active ingredient proved to be more toxic than reagent grade amitrole and the alkanolamine salt of 2,4-D was surprisingly less toxic than the free acid of 2,4-D. Each of the herbicides examined apparently exhibited more than one mode of toxic action as demonstrated by the time-mortality data. The experimental methods used would be of value in determining other herbicide effects, such as those on instar lengths, rates of molting, and susceptibilities of different naupliar stages to stress.

77-0829. Whitacre, D. M.; Badie, M.; Schwemmer, B. A.; Diaz, L. T. (Res. Dep., Velsicol Chem. Corp., Chicago, IL 60611). **Metabolism of ^{14}C-leptophos and ^{14}C-4-bromo -2,5- dichlorophenol in rats: a multiple dosing study.** *Bull. Environ. Contam. Toxicol.* 16(6): 689-696; 1976. (3 references)

Adult male and female Holtzman rats were given 0.5-2.0 μCi/day of ^{14}C-phenoxy or ^{14}C-phenyl labeled leptophos or ^{14}C-4-bromo -2,5- dichlorophenol (^{14}co-BDCP) by stomach tube. Excretion data demonstrated that continuous exposure of rats to leptophos in no way limited the capacity of the animals to excrete the substance efficiently and rapidly. Elimination was essentially complete within 72 hr of receiving a single dose or the last in a series of doses. Analysis of various tissues showed the highest residue levels in the liver. Even this constituted less than 0.25% of the cumulative dose on the sixth day following the last of 5 daily doses, however. More than 97% of the urinary leptophos was organosoluble. The phenoxy radiocarbon was excreted in the urine as BDCP, whereas the phenyl radiocarbon was excreted in the urine as O-methyl phenylphosphonic acid (90%), phenylphosphonic acid (10%), O-methyl phenylphonothioic acid (1%), and an unknown compound. Most of the organoextractable product of BDCP excreted in the urine was unchanged BDCP.

77-0830. Fabacher, D. L.; Davis, J. D.; Fabacher, D. A. (Dep. Biol., Mississippi Univ. Women, Columbus, MS 39701). **Apparent potentiation of the cotton defoliant DEF by methyl parathion in mosquitofish.** *Bull. Environ. Contam. Toxicol.* 16(6): 716-718; 1976. (3 references)

Mosquitofish (*Gambusia affinis*) were treated with 0.5 ppm DEF, 5.0 ppm methyl parathion, or a combination of the two pesticides. Mortality was 0% in fish treated with DEF, 8% in fish treated with methyl parathion, and 89% in fish treated with both chemicals. Since both compounds are toxic to mosquitofish, and DEF is more toxic than methyl parathion, the data indicate an apparent pro-

nounced increase in the toxicity of DEF by methyl parathion in this species. The data also suggest a possibility of fish kills as a result of spraying this mixture in the aquatic environment, or from the indiscriminate disposal of the mixture in ponds or creeks.

77-0831. Elliot, J. M.; Marks, C. F.; Tu, C. M. (Agric. Canada Res. Sta., Delhi, Ontario, Canada). **Effects of certain nematicides on soil nitrogen, soil nitrifiers, and populations of *Pratylenchus penetrans* in flue-cured tobacco.** *Can. J. Plant Sci.* 57(1): 143-154; 1977. (11 references)

Field experiments were conducted in 1973 and 1974 on Fox loam sand to study the effects of Telone (1,3-dichloropropene and related C_3 hydrocarbons), Telone C (1,3-dichloropropene and related C_3 hydrocarbons 85%, and chloropicrin 15%), Vorlex (1,3-dichloropropene and related C_3 hydrocarbons 80%, and methyl isothiocyanate 20%), and the non-fumigant nematicide oxamyl (methyl N′,N′-dimethyl-*N*- [(methyl-carbamoyl)oxy]-1-thiooxamidate) on soil nitrifying bacteria, soil nitrogen, and *Pratylenchus penetrans* (Cobb) Filip. and Stek. 1941 in flue-cured tobacco. Chloropicrin and triazophos (1-phenyl-3-(*O,O*-diethyl thionophosphoryl) 1,2,4-triazole), a non-fumigant, were also included in 1974. Soil treated with fumigant nematicides was higher in ammonium-N than untreated soil or soil treated with non-fumigant nematicides. Lower levels of nitrate-N were found in the soil 37 days after fumigation with Telone or Telone C and 28 days with Vorlex. Fumigant nematicides increased total mineralization, ammonium plus nitrate-N, or organic nitrogen in the soil; the effect lasted longer with Telone C and chloropicrin. *Nitrosomonas* spp. were higher in Telone- or Telone C-treated plots at 4 wk after fumigation and higher in all nematicide plots at 8 wk. *Nitrobacter* spp. were higher with Vorlex and oxamyl than in the check plots at 4, 6, and 8 wk after fumigation. Nematicides reduced the population of *P. penetrans* in the soil throughout the season in 1973 but control was less consistent in 1974. Oxamyl and triazophos gave good control of nematodes in roots of flue-cured tobacco. All nematicides tested gave an increase in yield of tobacco in 1973 but no significant increases were obtained in 1974. (Author abstract by permission)

77-0832. Stonard, M. D.; Greig, J. B. (MRC Toxicol. Unit, MRC Lab., Woodmansterne Rd., Carshalton, Surrey, England). **Different patterns of hepatic microsomal enzyme activity produced by administration of pure hexachlorobiphenyl isomers and hexachlorobenzene.** *Chem. Biol. Interact.* 15(4): 365-379; 1976. (46 references)

Three hexachlorobiphenyl isomers, 2,2′,4,4′,5,5′-hexachlorobiphenyl (I), 2,2′,3,3′,4,4′-hexachlorobiphenyl (II) and 2,2′,3,4,4′,5′-hexachlorobiphenyl (III), have been administered to rats and the effects of these three compounds upon hepatic microsomal drug metabolism and upon hepatic porphyrins have been studied. Comparisons have been made with hexachlorobenzene and a commercial polychlorinated biphenyl mixture, Aroclor 1254. From measurements of activities of microsomal drug oxidations in vitro, the durations of pharmacological actions of certain drugs in vivo and spectral shifts associated with cytochrome P-450 it is shown that the three pure hexachlorobiphenyl isomers initially produce changes in hepatic microsomal activity which resemble those seen after treatment with phenobarbitone (PB). In contrast, following chronic feeding of the isomers, compounds II and III but not I produce a pattern of hepatic microsomal enzyme activity which shows some characteristics of the 3-methylcholanthrene (3-MC) and some characteristics of the phenobarbitone classes of inducer. Also, compounds II and III, but not I, cause accumulation in the liver of porphyrins containing either seven or eight carboxyl groups. These two responses are similar to those observed following hexachlorobenzene treatment and suggest that a relationship may exist between the mixed pattern of enzyme induction and the onset of hepatic porphyrin accumulation.

77-0833. Nikandrov, V. N. (Belorussian Sci. Res. Inst. Epidemiol. Microbiol., USSR). **Enzimaticheskaia aktivnost' myshechnoi tkani pri miotonii, vyzvannoi dikhlorfenoksiatsetatom. [Enzyme activity of muscle tissue in myotonia induced by dichlorophenoxyacetate.]** *Dokl. Akad. Nauk BSSR* 20(7): 663-666; 1976. (19 references) (Russian)

Enzyme activities were studied in homogenates of the musculus gastrocnemius of Wistar rats 6 hr after oral administration of LD_{16} (myotonia-inducing dose) and 1/2 LD_{16} doses of 2,4-D ammonium salt and 2-mentyl-4-chlorophenoxy- gamma-butyrate (MCPB). Both doses of 2,4-D ammonium salt caused significant reduction of the LDH_2, malate dehydrogenase and mitochondrial aspartate aminotransferase activities, and significant increase in the LHD_4, LDH_5 and in the cytosol malate dehydrogenase and aspartate aminotransferase activities. On the other hand MCPB increased the LDH_4 and cytosol aspartate aminotransferase activities, and reduced the LDH_5, LDH_1 and mitochondrial aspartate aminotransferase activities. The findings indicate the role of changes in the oxalacetate metabolism catalyzed by malate dehydrogenase and aspartate aminotransferase in the pathogenesis of myotonia induced by 2,4-D.

77-0834. Mehendale, H. M. (Dep. Pharmacol. Toxicol., Univ. Mississippi Med. Ctr., Jackson, MS 38216). **Mirex-induced impairment of hepatobiliary function. Suppressed biliary excretion of imipramine and sulfobromophthalein.** *Drug Metab. Disposit.* 5(1): 56-62; 1977. (29 references)

Effect of pre-exposure to the pesticide mirex on hepatic uptake, metabolism, and biliary excretion of the tricyclic antidepressant, imipramine (IM), was studied by using isolated perfused rat liver preparations obtained from control and treated animals. Pretreatment of male rats with mirex (50 mg/kg/day, po, for 3 days) resulted in a

marked suppression (91%) of biliary excretion of endogenously formed polar metabolites of IMP. This impairment of biliary excretory function is related neither to the bile flow nor to the rate of metabolism of IMP. These conclusions are supported by the following observations: 1) pre-exposure to mirex results in a significant increase in bile secretion; 2) endogenously formed metabolites of IMP accumulate in increasing concentrations in the perfusate of liver preparations from mirex-treated rats; 3) over 98% of the IMP was metabolized by livers of both control and mires-treated rats. Furthermore, biliary excretion of exogenously provided polar metabolites of IMP was also suppressed by 88% of that of control livers. Addition of mirex (5×10^{-5} M) to the perfusate of control liver preparations was without effect on biliary excretion of IMP metabolites. Biliary excretion of sulfobromophthalein was also markedly suppressed (90%) by preexposure to mirex. These results suggest that mirex-induced impairment of hepatobiliary function is not specific to substrates. The mechanism of mirex-induced impairment is located at the site of transfer of otherwise readily excretable substances such as metabolites of IMP and sulfobromophthalein.

77-0835. Powers, C. D.; Rowland, R. G.; Wurster, C. F. (Mar. Sci. Res. Ctr., State Univ. N.Y., Stony Brook, NY 11794). **Dieldrin-induced destruction of marine algal cells with concomitant decrease in size of survivors and their progeny.** *Environ. Pollut.* 12(1): 17-25; 1977. (27 references)

Treatment of axenic cultures of the marine dinoflagellate *Exuviella baltica* with 10 parts per thousand million (10^9) of dieldrin inhibited growth rate and caused large numbers of cells to disintegrate within 12 h of exposure. The diameters of surviving cells averaged 11.2% smaller than controls; this size reduction persisted for at least four generations after cells were transferred to dieldrin-free medium. These effects of dieldrin contrasted with that of DDE, which merely inhibited growth rate. Pollutant-induced cell disintegration, size reduction and growth inhibition among sensitive phytoplankters in natural waters could affect those consumers that feed selectively according to algal species and particle size.

77-0836. Cooke, A. S. (Monks Wood Exp. Stn., Abbots Ripton, Huntingdon, England). **Effects of field applications of the herbicides diquat and dichlobenil on amphibians.** *Environ. Pollut.* 12(1): 43-50; 1977. (15 references)

The effects have been studied of normal field applications (1 mg/liter) of the herbicides diquat and dichlobenil on caged frog *Rana temporaria* and toad *Bufo bufo* tadpoles and on free-living populations of smooth newts *Triturus vulgaris*. Neither herbicide caused any mortality among the tadpoles or changed their development rate or level of activity. Tadpoles maintained in ponds treated with diquat, however, weighed less than control tadpoles four days after treatment and had fewer algae and diatoms in their intestines. After 18 and 32 days, tadpoles in ponds treated with either diquat or dichlobenil were heavier than control tadpoles. Herbicide treatment had resulted in blooms of algal species that the tadpoles apparently found highly acceptable. Although smooth newts bred in each pond after treatment and again the following year, herbicide treatment may have reduced the suitability of the ponds as newt breeding sites.

77-0837. Bresch, H.; Arendt, U. (Abteilung Exp. Pathol., Med. Hochsch. Hannover, Hanover, Germany). **Influence of different organochlorine pesticides on the development of the sea urchin embryo.** *Environ. Res.* 13(1): 121-128; 1977. (7 references)

The action of the pesticides aldrin, dieldrin, endrin, heptachlor, as well as DDT and methoxychlor, on the development of fertilized sea urchin eggs was investigated. Whereas dieldrin did not affect development, endrin demonstrated slight effects and aldrin led to greatly abnormal embryos. Heptachlor proved to be more toxic than aldrin and led to abnormal development and lysis of the embryos. Methoxychlor demonstrated toxic effects similar to those observed with heptachlor. Independent of these morphological observations, data on the incorporation of [^{3}H]thymidine in early developmental stages were obtained. Unlike all other compounds methoxychlor significantly inhibited deoxyribonucleic acid synthesis. In contrast to the effects produced here, methoxychlor is much less toxic to mammals than DDT. The meaning of these results for practical purposes is discussed. (Author abstract by permission)

77-0838. Dagley, S. (Dep. Biochem., Coll. Bol. Sci., Univ. Minnesota, St. Paul, MN 55108). **A biochemical approach to some problems of environmental pollution.** *Essays Biochem.* 11: 81-138; 1975. (195 references)

The problem of environmental pollution by manufactured chemicals is discussed from the biochemical point of view following a brief historical introduction. Evaluation of the problem of environmental pollution by mercury and manufactured pesticides is followed by discussion of microbial activities in the carbon cycle, the reactivity of oxygen towards biochemicals, and poisonous natural products and their detoxication. The biological activation of oxygen, the microbial degradation of benzenoid compounds, and the incomplete degradation of compounds by single microbial species are also considered. The last section deals with the evolution of degradative pathways of metabolism.

77-0839. Egyed, M. N.; Shlosberg, A. (Kimron Vet. Inst., Bet Dagan, Israel). **The efficiency of acetamide in the prevention and treatment of fluoroacetamide poisoning in chickens.** *Fluoride* 10(1): 34-37; 1977. (11 references)

The antidotal effect of acetamide (AA) was studied in chickens. For this purpose the acute LD_{50} of orally administered fluoroacetamide (FAA) was determined in 2

to 3 month old Leghorn chickens and was found to be 4.25 mg/kg. AA was administered orally at dose rates of 0.5 g and 2.5 g/kg. Only at the higher dosage rate did AA prevent the lethal action of FAA (10 mg/kg) when given one hour before, at the same time or 10 or 20 minutes after the administration of FAA. The same dose of AA failed to prevent the death of chickens when given 30 to 60 minutes after the administration of FAA.

77-0840. Hutson, D. H. (Shell Res. Ltd., Tunstall Lab., Sittingbourne Res. Cent., Sittingbourne, Kent, England). **Comparative metabolism of dieldrin in two strains of mouse (FC1 and LACG).** *Food Cosmet. Toxicol.* 14(6): 577-591; 1976.

The comparative metabolism of [^{14}C]dieldrin has been investigated in control and dieldrin-pretreated rats and mice. Metabolites excreted in the urine and feces and retained in the livers, kidneys and fat of the five animals in each treatment group were investigated. Pretreated animals received 20 ppm (rats) or 10 ppm (mice) of dieldrin in their diet for 28 days prior to the ingestion of [^{14}C]dieldrin. The metabolism of [^{14}C]dieldrin in liver microsomal preparations has also been examined. The major metabolic pathways of dieldrin, leading to 12-hydroxydieldrin, 4,5-*trans*-dihydroaldrindiol, aldrin-derived dicarboxylic acid and the pentachloroketone are present in both rats and mice. The main differences between the species were a more rapid metabolism of dieldrin in rats, a much greater production of the pentachloroketone by rats, and the production of small amounts of polar urinary metabolites by mice. The two strains of mice were similar to one another in most but not all of the parameters measured. The results are discussed in relation to the increased incidence of liver tumors in CF1 mice exposed to dieldrin. (Author abstract by permission)

77-0841. Hiles, R. A.; Bruce, R. D. (Procter & Gamble Co., Miami Valley Labs., Cincinnati, OH). **2,3,7,8-Tetrachlorodibenzo-*p*-dioxin elimination in the rat: first order or zero order?** *Food Cosmet. Toxicol.* 14(6): 599-600; 1976. (8 references)

Data on the elimination of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin from the rat were analyzed for the best fit to a zero- or a first-order kinetic process. The limited data available made it impossible to distinguish the order of the process, and therefore previously reported values for the half-life of this compound may be invalid. The nature of the mathematics used and the importance of the kinetic order in evaluating the disposition of xenobiotics are discussed. (Author abstract by permission)

77-0842. Goncharuk, E. I.; Spasov, A. S.; Shevtsova, I. I.; Ukrainskii, V. V. (Kiev Med. Inst., Kiev, USSR). **K obosnovaniiu metodiki izucheniia deistviia khimicheskikh veshchestv na pochvennuiu mikrofloru. [Substantiation of methods for studying the effects of chemicals on soil microflora.]** *Gig. Sanit.* (6): 59-62; 1976. (9 references) (Russian)

The effect of the soil moisture content on the effect of polychloropinene (strobane) on soil microorganisms and on enzymatic activities was studied in podzol type soil with 0.96% humus and pH 5.0. The moisture content was set at 60% and 100% of the theoretical moisture retention capacity. Ninety days after the introduction of 1 mg/kg polychloropinene, the microorganism count was 47.5% of the original level in the moistened control, and 112.8% of the control in dry soil, vs. 49.4% in the control and 116.7% of the control in experiments with 10 mg/kg. At 60% and 100% moisture contents, the microorganism counts were higher than in dry soil with both 1 and 10 mg/kg of polychloropinene. The rate of degradation for polychloropinene after 90 days was highest at 60% moisture content, lowest in dry soil (90% vs. 65% at 1 mg/kg; 75% vs. 55% at 10 mg/kg). At optimal moisture content, fungi were most sensitive to polychloropinene. At 100% moisture content, 10 mg/kg doses of polychloropinene had no noticeable effect on the catalase and nitrification activities; it increased the dehydrogenase activity and reduced the protease activity. Polychloropinene reduced the dehydrogenase activity in dry soil. The findings indicate the strong influence of the soil mositure content on the effect of pesticides on soil microorganisms and biochemical processes.

77-0843. Aleshina, E. P. (Rostov-na-Donu Scientific Research Institute of Epidemiology, Microbiology and Hygiene, Rostov-on-Don, USSR). **Eksperimental'noe izuchenie deistviia pestitsidov na mikrofloru vodoemov. [Experimental study of effects of pesticides on aquatic microflora.]** *Gig. Sanit.* (6): 97-99; 1976. (6 references) (Russian)

The effects of propanide (propanil) and trichlorfon on the aquatic microflora were studied. Propanide present in concentrations of 20-200 mg/liter had bactericidal effects on *Escherichia coli* and on enterococci. Lower concentrations had only a bacteriostatic effect. Trichlorfon, added in concentrations of 5-500 mg/liter, stimulated the growth of *E. coli* and enterococci, but sharp growth inhibition was observed on the ninth day, probably due to a change in pH. Both substances stimulated saprophytes. The findings indicate that propanide and trichlorfon interfere with the bacterial self-purification of water, deteriorating its hygienic quality.

77-0844. Preussmann, R.; Eisenbrand, G.; Schmahl, D. (Inst. Toxicol. Chemotherapy, German Cancer Res. Cent., Heidelberg, Germany). **Carcinogenicity testing of low doses of nitrosopyrrolidine and of nitrosobenzthiazuron and nitrosocarbaryl in rats.** *IARC Sci. Publ.* 14: 429-433; 1976. (9 references)

Male and female Sprague-Dawley rats were given nitrosopyrrolidine (0.3-10 mg/kg/day) in the drinking water, nitrosobenzthiazuron (5 or 20 mg/kg/wk) by stomach tube, or nitrosocarbaryl (130 mg/kg twice weekly) by

stomach tube. Treatments were continued until the animals died or become moribund. All animals were fed Altromin. At 3-10 mg/kg, nitrosopyrrolidine produced a high incidence of liver tumors, the mean tumor induction time (T_{50}) being 436 days at 10 mg/kg and 515 days at 3 mg/kg. No typical liver tumors were induced after about 600 days of treatment with lower doses. Nitrosobenzthiazuron at 5 and 20 mg/kg/wk produced a high incidence of kidney, forestomach, and liver tumors with a T_{50} at the highest dose at 448 days. Nitrosocarbaryl also produced a high incidence of tumors of the forestomach, with a T_{50} of 167 days. The data suggest that the relatively regular occurrence of nitrosopyrrolidine in cooked bacon and other nitrite-treated and heated meat products is a serious health risk.

77-0845. Singh, R.; Iyengar, L.; Prabhakara Rao, A. V. S. (Environ. Eng. Lab., Dep. Civil Eng., Indian Inst. Technol., Kanpur, India 208016). **Utilization of heptachlor by fungi.** *Indian J. Exp. Biol.* 14(4): 466-468; 1976. (14 references)

Heptachlor utilization by six fungi, *Aspergillus flavus*, *A. fumigatus*, *Penicillicim citrinum*, *P. funiculosum*, *Curvularia lunata* and *Trichoderma lignorum* was studied. In the presence of sucrose, fungi tolerated high concentrations of heptachlor although removal of heptachlor varied with the species. There was negligible accumulation of heptachlor in the mycelium. Production of penicillin by *P. funiculosum* was adversely affected in the presence of the pesticide.

77-0846. Singh, B. D. (Dep. Genet. Plant Breeding, Banaras Hindu Univ., Varanasi, India). **Comparison of cytogenetic effects of IAA, NAA and 2,4-D in callus cultures of *Haplopapus gracilis* (Nutt.) Gray.** *Indian J. Exp. Biol.* 14(4): 524-526; 1976. (19 references)

H. gracilis callus cultures were initiated and maintained on agar B5 medium containing 2 μg/ml NAA or 2,4-D with or without 0.1 μg/ml kinetin, or IAA with kinetin. Frequencies of anaphase anomalies in calli cultured on the 3 growth regulators were comparable. Kinetin consistently increased the frequency of irregularities with 2,4-D, but not with NAA.

77-0847. Singh, B. D.; Singh, R. M.; Singh, R. B.; Singh, Y. (Dep. Genet. Plant Breeding, Banaras Hindu Univ., Varanasi, India). **Reduction in anaphase bridge frequency by 2,4-D in irradiated and normal wheat (*Triticum aestivum L.*) root tips.** *Indian J. Exp. Biol.* 14(4): 526-527; 1976. (18 references)

Normal and irradiated (20 kr γ-rays) seeds of spring bread wheat were germinated in distilled water, 10 μg/ml IAA, NAA, or 0.1, 1 and 10 μg/ml 2,4-D. IAA and NAA drastically reduced the frequency of laggards at anaphase, but 2,4-D had no effect. 2,4-D, especially 1 μg/ml, reduced the frequency of bridges and increased that of fragments; NAA had some effect, but IAA was ineffective. Thus low concentrations of 2,4-D reduced anaphase bridge frequency in root tips.

77-0848. Gaughan, L. C.; Unai, T.; Casida, J. E. (Dep. Entomol. Sci., Univ. Calif., Berkeley, CA). **Permethrin metabolism in rats.** *J. Agric. Food Chem.* 25(1): 9-17; 1977. (17 references)

hen administered orally to male rats at 1.6 to 4.8 mg/kg, the [1*R*,trans], [1*RS*,trans], [1*R*,cis], and [1*RS*,cis] isomers of the potent pyrethroid insecticide permethrin [3-phenoxybenzyl 3-(3,3-dichlorovinyl)- 2,2-dimethylcyclopropane carboxylate] are rapidly metabolized, and the acid and alcohol fragments are almost completely eliminated from the body within a few days. *cis*-Permethrin is more stable than *trans*-permethrin and the *cis* compound yields four fecal ester metabolites which result from hydroxylation at the 2′-phenoxy, 4′-phenoxy, or 2-*trans*-methyl position or at both of the later two sites. Other significant metabolities are 3-phenoxybenzoic acid (free and glucuronide and glycine conjugates), the sulfate conjugate of 4′-hydroxy-3-phenoxybenzoic acid, the sulfate conjugate of 2′-hydroxy-3-phenoxybenzoic acid (from *cis*-permethrin only), the *trans*- and *cis*-dichlorovinyl dimethyl cyclopropane carboxylic acids (free and glucuronide conjugates), and the 2-*trans*- and 2-*cis*-hydroxymethyl derivatives of each of the aforementioned *trans* and *cis* acids (free and glucuronide conjugates). (Author abstract by permission of the American Chemical Soceity)

77-0849. Sundstrom, G. (Lab. Environ. Chem., Univ. Amsterdam, Amsterdam, The Netherlands). **Metabolic hydroxylation of the aromatic rings of 1,1-dichloro-2,2-*bis*(4- chlorophenyl)ethylene (*p,p′*-DDE) by the rat.** *J. Agric. Food Chem.* 25(1): 18-21; 1977. (36 references)

Four phenolic metabolites of *p,p′*-DDE were identified in rat feces after dosing with *p,p′*-DDE. The structures of the metabolites, 2-hydroxy-4,4′-DDE, 3-hydroxy-4,4′-DDE, 4-hydroxy-3,4′-DDE, and 4-hydroxy-4′-DDE, were ascertained by spectral and chromatographic comparisons with synthetic material. Two of the metabolities show structures which suggest the initial formation of an arene oxide in the metabolic process. (Author abstract by permission of the American Chemical Society)

77-0850. Gandolfi, A. J.; Buhler, D. R. (Dep. Agric. Chem. and Environ. Health Sci. Cent., Oregon State Univ., Corvallis, OR). **Metabolism of hexachlorophene in the rabbit. Excretion, tissue distribution, and characterization of the urinary glucuronide conjugate.** *J. Agric. Food Chem.* 25(1): 21-25; 1977. (26 references)

Rabbits were given intraperitoneal doses of 10 or 15 mg/kg [^{14}C]hexachlorophene. About 48-52% of the administered radioactivity was excreted in the feces and

21-25% in the urine over a 3.5-4-day period. Unchanged hexachlorophene (HCP) was a major constituent of feces (78%) and urine (29%) of rabbits receiving a 15 mg/kg dose of [^{14}C]HCP. The major urinary metabolite (56%), HCP glucuronide, was isolated and characterized. (Author abstract by permission of the American Chemical Society)

77-0851. Reddy, G.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois at Chicago Circle, Chicago, IL). **Metabolism of [^{14}C]photodieldrin in house flies.** *J. Agric. Food Chem.* 25(1): 25-28; 1977. (20 references)

Metabolism of [^{14}C]photodieldrin was studied in male and female house flies. It was found that the rate of metabolism is relatively higher in female flies. The analyses of extracts of whole flies (organic and aqueous) and their feces by TLC followed by autoradiography revealed the presence of three metabolites and photodieldrin. Two of these metabolites were identified as *trans*-photoaldrindiol and another one as a ketone derivative of photodieldrin. (Author abstract by permission of the American Chemical Society)

77-0852. Anderson, B. M.; Noble, C. Jr. (Dep. Biochem. Nutr., Virginia Polytech. Inst. and State Univ., Blacksburg, VA). **In vitro inhibition of lactate dehydrogenases by kepone.** *J. Agric. Food Chem.* 25(1): 28-31; 1977. (7 references)

Lactate dehydrogenase catalyzed reactions, both the oxidation of lactate and the reduction of pyruvate, are effectively inhibited by low concentrations of the polychlorinated hydrocarbon pesticide, Kepone (chlordecone). The previous report [Hendrickson, C. M., and Bowden, J. A., *J. Agric. Food Chem.* 23, 407 (1975)] of Kepone inhibition of rabbit muscle lactate dehydrogenase catalyzed reduction of pyruvate was confirmed; however, a lower *K*i value and a different type of inhibition were observed in the present study. The extension of these studies to the investigation of homologous isozymes of lactate dehydrogenase revealed Kepone to be an effective inhibitor of several M_4 isozymes while showing no inhibition (within limits of solubility) of several H_4 isozymes. When detailed studies of the Kepone inhibition were made, mixed inhibition with respect to both substrates and noncompetitive inhibition with respect to the pyridine nucleotide coenzymes were observed. Changes in pH, solvents for Kepone solubilization, and types of buffer had little effect on the Kepone inhibition. The inhibition was observed through dilution experiments to be a fully reversible type of inhibition and no time-dependent inactivation of lactate dehydrogenases was observed in these studies. Studies were carried out with homologous isozymes from rabbit, beef, pig, and chicken. (Author abstract by permission of the American Chemical Society)

77-0853. Chopra, M. (Tob. Pestic. Res. Proj., North Carolina Agric. Tech. State Univ., Greensboro, NC). **Metabolism of endosulfan I, endosulfan II, and endosulfan surfate in tobacco leaf.** *J. Agric. Food Chem.* 25(1): 32-36; 1977. (20 references)

Tobacco plants were separately treated on July 30, 1973 with 0.75 and 1.50 lb/acre of endosulfan I and II and endosulfan sulfate. Leaves from these treatments were harvested on Aug 4, 13, and 23, 1973, and analyzed for metabolites. Endosulfan I, endosulfan sulfate, endosulfandiol, endosulfan ether, and endosulfan lactone were found in the leaves of all the treatments. However, endosulfan II was found only in endosulfan I and II treated leaves. Thus, in tobacco leaf endosulfan I and II are interconvertible; endosulfan sulfate is converted into endosulfan I but not into endosulfan II; and endosulfan I and II and endosulfan sulfate can directly hydrolyze into endosulfandiol. Based on this research a new pathway was proposed for the metabolism of endosulfan in tobacco leaf. (Author abstract by permission of the American Chemical Society)

77-0854. Korth-Schutz, S.; Levine, L. S.; Roth, J. A.; Saenger, P.; New, M. I. (Dep. Pediat., New York Hospital-Cornell Univ. Med. Ctr., New York, NY 10021). **Virilizing adrenal tumor in a child suppressed with dexamethasone for three years. Effect of *o,p'*-DDD on serum and urinary androgens.** *J. Clin. Endocrinol. Metab.* 44(3): 433-439; 1977. (16 references)

Extensive hormonal evaluation was performed in a girl with adrenal carcinoma during the primary tumor stage, following adrenalectomy, during the period when metastases were evident and while on treatment with *o,p'*-DDD. At the age of 14 months a diagnosis of congenital adrenal hyperplasia was made and treatment with dexamethasone (0.125 to 0.25 mg/day) resulted in a fall-off in growth rate, normal advancement in bone age, decrease in virilization and suppression of 17-ketosteroid excretion which continued until 4 3/12 years of age when virilization increased. At five years of age elevated serum and urinary androgen levels unsuppressible with dexamethasone were noted. Following removal of a large right adrenal carcinoma, serum and urinary hormone levels returned to normal. Three months following surgery, liver metastases were documented, associated with elevated levels of serum androgens. With *o,p'*-DDD treatment, serum dehydroepiandrosterone sulfate (DS) and urinary 17-ketosteroid (17-KS) excretion fell rapidly, while there was a delay in the fall of free androgens. The persistence of free steroid secretion with decreased formation of DS suggests that the *o,p'*-DDD may have altered sulfatase activity before causing tumor necrosis and total decrease in steroidogenesis.

77-0855. Woodward, D. F. (U.S. Fish Wildlife Serv., Fish-Pestic. Res. Lab., Jackson, WY). **Toxicity of the herbicides dinoseb and picloram to cutthroat (*Salmo clarki*) and lake trout (*Salvelinus namaycush*).** *J. Fish Res. Board Can.* 33(8): 1671-1676; 1976. (21 references)

In static tests of the toxicity of two herbicides,

dinoseb (2,4-dinitro -6-*sec*-butylphenol) and picloram (4-amino- 3,5,6-trichloropicolinic acid), to cutthroat (*Salmo clarki*) and lake trout (*Salvelinus namaycush*), the 96-h LC50s ranged from 32 to 14000 μg/liter for dinoseb and from 2050 to 8600 μg/liter for picloram. Decreasing pH from 8.5 to 6.5 increased the toxicity of dinoseb by a factor of 43 and decreased that of picloram by a factor of 0.5. Generally, toxicity increased with increasing water temperature. Sensitivity of both species of fish increased with water hardness in tests of dinoseb but was not affected by water hardness in tests of picloram. The toxicity of both chemicals was not changed by aging in water for up to 4 wk or by exposing the fish longer than 96 h. Rate of yolk sac absorption and growth of lake trout fry was reduced in flow-through tests at concentrations as low as 0.5 μg/liter dinoseb or 35 μg/liter picloram. Chronic toxicity of both compounds on early life stages of lake trout is more significant than might be anticipated on the basis of only acute tests with fingerlings. (Author abstract by permission)

77-0856. DeFrietas, A. S. W.; Gidney, M. A. J. (Nat. Res. Counc. Canada, Ottawa, Ontario, Canada). **Influence of lipid pool size on bioaccumulation of the insecticide chlordane by northern redhorse suckers (*Moxostoma macrolepidotum*).** *J. Fish Res. Board Can.* 34(1): 89-94; 1977. (21 references)

An effect of the lipid pool size on the accumulation and clearance of *cis*- and *-trans*-chlordane by northern redhorse suckers (*Moxostoma macrolepidotum*) has been demonstrated. A technique was developed using ^{203}Hg-labeled methylmercury as a tracer, which permits the direct determination of the assimilation efficiency from food and the biological half-life of chlorinated hydrocarbons in terms of individual fish. Tissue retention of the insecticide chlordane in fish was directly proportional to the adiposity of the fish. For a fish containing 2% lipid, the half-life of the *cis*-isomer was 60 days and for the *trans*-isomer, 33 days. The net assimilation efficiency from food to fish tissue was also influenced by adiposity. These results on uptake and clearance, when used in a simple model for pollutant bioaccumulation, indicate that the steady state concentration of chlordane in fish will not exceed the concentration of chlordane in the diet unless the adiposity of the fish is high. (Author abstract by permission)

77-0857. Addison, R. F.; Zinck, M. E. (Dep. Environ., Fisheries Mar. Serv., Mar. Ecol. Lab., Bedford Inst. Oceanogr., Dartmouth, Nova Scotia, Canada). **Rate of conversion of ^{14}C-*p,p'*-DDT to *p,p'*-DDE by brook trout (*Salvelinus fontinalis*): Absence of effect of pretreatment of fish with compounds related to *p,p'*-DDT.** *J. Fish Res. Board Can.* 34(1): 119-122; 1977. (12 references)

Brook trout (*Salvelinus fontinalis*) fingerlings were given four injections at weekly intervals of either *p,p'*-DDT, *p,p'*-DDD, or *p,p'*-DDMU to yield tissue concentrations of 1-5 mg/kg wet wt. The effect of these treatments on the subsequent dehydrochlorination of an injection of ^{14}C-*p,p'*-DDT was investigated. The rate of dehydrochlorination of ^{14}C-*p,p'*-DDT by the trout was not influenced by these treatments and was more highly correlated with factors such as the weight of the fish and their lipid content. Of the compounds injected during the treatment of the fish, *p,p'*-DDMU was cleared more rapidly than the others. (Author abstract by permission)

77-0858. Green, D. M.; Muir, A. W.; Stratton, J. A.; Inch, T. D. (Chem. Defense Establishment, Porton Down, Salisbury, Wiltshire SP4 0JQ, England). **Dual mechanism of the antidotal action of atropine-like drugs in poisoning by organophosphorus anticholinesterases.** *J. Pharm. Pharmacol.* 29(1): 62-64; 1977. (16 references)

The central and peripheral antimuscarinic activities of atropine and five related drugs in mice were compared with their ability, when used with an oxime, to protect rats against poisoning by Sarin. The results indicated that only for protection against low doses of Sarin is there a relation between protective action and antimuscarinic action. The data are consistent with the notion that in addition to their antimuscarinic properties, atropine-like drugs provide protection against poisoning by Sarin by at least one additional mechanism. Tests in rats showed no quantitative relationship between the anticonvulsant activities of the atropine-like drugs and their protection against Sarin poisoning. It was possible to relate time-activity profiles for protection and anticonvulsant time-activity profiles, indicating that the anticonvulsant properties of atropine-like drugs become important for protection against higher doses of anticholinesterases. In man, where only lower doses of antimuscarinic drugs are usually administered, the antimuscarinic properties would be the most important.

77-0859. Elo, H.; Parvinen, M. (Inst. Biomed. Sci., Univ. Tampere, Tampere, Finland). **Effect of sodium 2-methyl -4- chlorophenoxyacetate on spermatogenesis in the rat.** *J. Reprod. Fertil.* 48: 243-244; 1976. (8 references)

Nine-week-old male Sprague-Dawley rats were allowed free access to drinking water containing 100-300 ppm of the sodium salt of 2-methyl -4- chlorophenoxyacetic acid (MCPA-Na) for 2 mon. Stained 5 μm-thick paraffin-wax sections of the testes were examined microscopically and 50 seminiferous tubules in each section were evaluated at random. At 1000 ppm or greater, MCPA-Na retarded body weight increase but had no significant effect on testicle weight. Concentrations above 1000 ppm also produced degenerative alterations in the seminiferous epithelium. Concentrations above 2000 ppm caused an enhanced loss of maturing spermatids and occasional degeneration of young spermatids and pachytene spermatocytes. However, some animals given 3000 ppm MCPA-Na had almost normal spermatogenesis. The data indicate that relatively high concentrations of MCPA-Na in the drinking

water induce only minor histological alterations in the seminiferous epithelium of the rat testis.

77-0860. Koschier, F. J.; Berndt, W. O. (Dep. Pharmacol. Toxicol., Univ. Mississippi Med. Ctr., Jackson, MS). **Studies on the mechanism of renal transport depression caused by pretreatment with 2,4,5-trichlorophenoxyacetate.** *J. Toxicol. Environ. Health* 2(2): 323-334; 1976. (16 references)

Relatively low toxicity in the adult has been reported for the organic acid herbicides 2,4-dichlorophenoxyacetate and 2,4,5-trichlorophenoxyacetate (2,4,5-T). Although small doses of these herbicides are excreted rapidly, acute impairment of renal excretion has been reported when large doses of herbicide were administered. After the administration of 2,4,5-T in vitro analysis of renal proximal tubular function showed a decrease in the activity of the organic acid transport system which handles these herbicides. In addition, the pretreated animals show an impairment in the organic base transport system. To determine the nature of 2,4,5-T renal depression, renal cortical slices from herbicide-pretreated animals were studied. Alterations in the initial influx of organic ions, steady-state accumulation, and efflux were measured. Furthermore, a specific and reversible depression of tissue oxygen consumption was demonstrated. These changes do not appear to be the result of alterations in the gross morphology, electrolyte composition, or cell water content of the renal cortex.

77-0861. Arnold, D. W.; Kennedy, G. L., Jr.; Keplinger, M. L.; Calandra, J. C. (Industrial Bio-Test Labs. Inc., Northbrook IL 60062). **Dominant lethal studies with technical chlordane, HCS-3260, and heptachlor: heptachlor epoxide.** *J. Toxicol. Environ. Health* 2(3): 547-555; 1977. (7 references)

Male albino mice in groups of eight were each given single doses, either by gavage or by intraperitoneal injection, of either technical chlordane (50 or 100 mg/kg), HCS-3260 (50 or 100 mg/kg), or heptachlor:heptachlor epoxide (25:75) (7.5 or 15 mg/kg). The males were subsequently mated with three untreated females for six consecutive weeks. No dominant lethal changes among females that had mated with the treated males were produced.

77-0862. Hansen, L. G.; Wilson, D. W.; Byerly, C. S.; Sundlof, S. F.; Dorn, S. B. (Div. Pharmacol. Toxicol., Coll. Vet. Med., Univ. Illinois, Urbana, IL). **Effects and residues of dietary hexachlorobenzene in growing swine.** *J. Toxicol. Environ. Health* 2(3): 557-567; 1977. (17 references)

Crossbred weanling gilts were fed a standard ration containing 0, 1, 10, or 100 ppm purified hexachlorobenzene (HBC) for 13 wk. No mortalities, ill health, neurological disorders, or significant depressions in weight gain were observed. Postmortem examination revealed brightly fluorescent livers at all levels of HCB. The group receiving 1000 ppm had a tendency for smaller spleens, larger livers with swollen hepatocytes, and decreased lymphocytes. HCB accumulated in the dissectable fat of growing swine to concentrations five- to sevenfold higher than the dietary concentration; residues in 11 other tissues examined were below the dietary concentration.

77-0863. Sauerhoff, M. W.; Braun, W. H.; LeBeau, J. E. (Health Environ. Res., Dow Chem. Co., Midland, MI 48640). **Dose-dependent pharmacokinetic profile of silvex following intravenous administration in rats.** *J. Toxicol. Environ. Health* 2(3): 605-618; 1977. (5 references)

The pharmacokinetic profile of silvex was defined in rats after single intravenous doses of 5 and 50 mg/kg ^{14}C ring-laveled silvex. Clearance of silvex from plasma at the 5 mk/kg dose was linear with half-life of 16.2 hr, while clearance at the 50 mg/kg dose was nonlinear. Activities of ^{14}C recovered in excreta were 94.1 and 95.1% of the administered doses at 5 and 50 mg/kg, respectively. Excreta was collected for 192 hr at 5 mkg/kg and 216 hr at 50 mg/kg. Urinary excretion of ^{14}C activity accounted for 80.5 and 68.7% of the administered dose at 5 and 50 mg/kg, respectively; fecal excretion accounted for 13.7 and 26.4% of the administered dose at 5 and 50 mg/kg, respectively. Urinary excretion of silvex is saturated at the 50 mg/kg dose. Significant amounts of silvex are excreted in bile and undergo enterohepatic circulation. Concentrations of silvex in liver and kidney are higher than those in fat, brain, and muscle 8 and 216 hr after administration. In a companion oral study, silvex was extensively if not completely absorbed. The pharmacokinetic data presented indicate that statistical projection of experimental results with large doses of silvex to predict the hazard of exposure to small amounts is not justified because the capability to excrete silvex in urine has been saturated.

77-0864. Berdanier, C. D. (Nutrition Inst., Agric. Res. Serv., Beltsville, MD). **Effect of exercise on the responses of rats to DDT.** *J. Toxicol. Environ. Health* 2(3): 651-656; 1977. (17 references)

Two groups of 30 male weanling rats were maintained on a nutritionally adequate diet containing 45% carbohydrate, 16% fat, and 29% protein with or without 1 ppm added DDT. At 100 days of age the two groups were subjected to an oral glucose tolerance test. The groups were then subdivided and half of each group was forced to run 1/16 mi/30 min-day on a treadmill. At 190 days of age the glucose tolerance test was repeated. The animals were killed at 200 days of age, and the lipid content of the serum, liver, and carcass was determined. Serum insulin levels and the DDT levels in the adipose tissue reflected the DDT content of the diet, and no differences in these levels were demonstrated with the addition of the exercise treatment. DDT treatment resulted in lower serum and liver cholesterol and serum insulin levels in sedentary rats. Exercise

lowered liver cholesterol and serum insulin in non-DDT-treated rats. When both treatments were imposed, serum insulin cholesterol levels rose. Significant DDT-exercise interaction effects were observed on the glucose tolerance, serum and liver cholesterol, and serum insulin levels.

77-0865. Powell, M. L.; Pope, B.; Elmer, G. W.; Trager, W. F. (Dep. Pharmaceut. Sci., Sch. Pharm., Univ. Washington, Seattle, WA). **Biliary excretion of warfarin metabolites and their metabolism by rat gut flora.** *Life. Sci.* 20(1): 171-178; 1977. (21 references)

The bile was determined to be the major excretory route for ^{14}C-warfarin in the rat with approximately 10% of the administered dose excreted within 5 hours after injection. Relatively little radioactivity appeared in the feces, indicating that considerable enterohepatic recycling was taking place. Less than 4% of the radioactivity in the bile could be extracted with organic solvents. Following incubation of the bile with β-glucuronidase or rat gut flora, however, the bulk of the radioactivity was extractable. The extent of gut flora-mediated hydrolysis of these polar biliary warfarin conjugates was approximately the same as obtained with β-glucuronidase. Approximately 1/3 of the gut flora-hydrolyzable conjugates were labile and subject to nonenzymatic hydrolysis at 37 C for 24 h. Chromatographic examination of the extracts from βglucuronidase-treated bile revealed the presence of warfarin and 4′-, 6-, 7-, and 8-hydroxywarfarin. Warfarin and 7-hydroxywarfarin were the most abundant metabolites in the extracts. (Author abstract by permission)

77-0866. Zetterberg, G.; Busk, L.; Elovson, R.; Starce-Nordenhammer, I.; Ryttman, H. (Dep. Genet. Plant Breed., Univ. Uppsala, Uppsala, Sweden). **The influence of pH on the effects of 2,4-D (2,4-dichlorophenoxyacetic acid, Na salt) on *Saccharomyces cerevisiae* and *Salmonella typhimurium*.** *Mutat. Res.* 42(1): 3-18; 1977. (17 references)

The genetic effects of 2,4-D (2,4-dichlorophenoxyacetic acid, Na salt) have been investigated in cells of the yeast *Saccharomyces cerevisiae* and of the bacterium *Salmonella typhimurium* in experiments in vitro and in vivo. Experiments in vitro showed that the killing of both yeast and bacteria is dependent on the pH in the treatment solution of 2,4-D. A dose-dependent increase of the frequency of mitotic gene conversion and mitotic recombination in yeast was observed at pH 4.50 and 4.30. In experiments in vitro with two strains of Salmonella no significant increase of the number of revertants to prototrophy was obtained. The positive correlation between survival of cells and dissociation of 2,4-D in the pH region 2.8-5.0 indicates that the cells are unable to take up dissociated 2,4-D. Therefore the survival is high at a high pH when most 2,4-D is in dissociated form, and the survival is low at a relatively low pH when more of the 2,4-D is in its undissociated form. No genetic effects were induced by oral administration of tolerable doses of 2,4-D in host-mediated assays using mice as hosts and yeast or Salmonella as indicator cells. (Author abstract by permission)

77-0867. Ahmed, F. E.; Hart, R. W.; Lewis, N. J. (Dept. Biophys., Ohio State Univ., Columbus, OH). **Pesticide induced DNA damage and its repair in cultured human cells.** *Mutat. Res.* 42(2): 161-174; 1977. (63 references)

The effects of pesticides on the induction of unscheduled DNA synthesis in SV-40 transformed human cells (VA-4) in culture with and without metabolic activation by liver microsomes was studied. Results showed that ten of the thirteen compounds examined either directly or upon metabolic activation induced unscheduled DNA synthesis in the human cell system used. The DNA repair kinetics and size of the repaired regions resulting from treatment with four of the chemicals (carbaryl, chlordane, dieldrin, and 2,4-D fluid) were studied by 313 nm photolysis of repaired regions containing bromodeoxyuridine (BUdR). The size of the repaired regions differed between compounds but could generally be classified as either of the X-ray (short) or UV-type (long). (Author abstract by permission)

77-0868. Sharma, C. B. S. R.; Sahu, R. K. (Cytogenet. Lab., Dep. Bot., Berhampur Univ., Berhampur, Orissa, India). **I. A preliminary study on the response of root meristems to exotoxin from *Bacillus thuringiensis* a constituent of a microbial insecticide, thuricide.** *Mutat. Res.* 46(1): 19-26; 1977. (46 references)

It is reported for the first time that the exotoxin, thuringiensin A, from *Bacillus thuringiensis*, a component of the insecticide thuricide, inhibits spindle and cytokinesis and induces micronuclei, chromocentric nuclei and minor deviations in spindle activity. The binucleate cells also undergo mitosis yielding biprophases and bimetaphases. Spindle seems to have been inhibited even in bimetaphase. Microtubular systems and chromosomes are implicated as the primary targets. Most effects resemble those of caffeine, colchicine, aminopyrine, chloral hydrate and vinblastine to different extents, and are therefore suggestive of the anti-neoplastic and mutagenic potentialities of the exotoxin. The extensive use of thuricide on crop plants, in view of its mutagenic potential, may be hazardous. The results also suggest that the exotoxin may be used as a pre-treating agent in chromosome analysis and as a candidate-tagging tool for synchronization and cell cycle analysis, besides its probable utility in studies on cancer cells. (Author abstract by permission)

77-0869. Ficsor, G.; Bordas, S.; Wade, S. M.; Muthiani, E.; Wertz, G. F.; Zimmer, D. M. (Dep. Biol., Western Michigan Univ., Kalamazoo, MI). **Mammalian host- and fluid-mediated mutagenicity assays of captan and streptozotocin in *Salmonella typhimurium*.** *Mutat. Res.* 48(1):

1-16; 1977. (34 references)

The mutagenicity of captan and of streptozotocin was treated in vivo by revision of *hisG46* base-pair substitution histidine auxotrophs of *Salmonella typhimurium* in the peritoneal cavity or in blood, plasma or urine of rats or mice. Genetic response was determined by the frequency of revertants (quantitative test) or by the number of revertants per plate (semiquantitative test). In quantitative HMA captan gave negative results following 3 hourly 500 mg/kg s.c. doses or 1000 mg/kg oral dose in mice with *hisG46* mutant or 2000 mg/kg oral dose in rats with the *hisG46, uvrB* (TA1950) mutant. The positive control SZN induced many reversions at 0.5 mg/kg i.p. or 10 or 100 mg/kg oral doses. In semiquantitative in vivo blood or urine assays captan gave negative results after a 250 mg/kg oral dose with *hisG46*. SZN in the same experiment gave positive results in both fluids. Negative results were obtained with captan in both semiquantitative and quantitative in vivo blood assays following 1000 mg/kg i.p. or 2000 mg/kg oral doses in the rat with TA1950. Rat blood mixed with captan for 45 min before adding TA1950 cells inactivated 1000 μg captan/ml but not 5000 μg/ml in the semiquantitative test. Corresponding figures in the quantitative test were 500 μg/ml. Rat plasma inactivated the mutagenicity of about 10 times captan than rat blood. Human blood inactivated about as much captan as rat blood. The mutagenicity of captan was inactivated more efficiently than of SZN by blood. The results of the experiments suggested that captan's mutagenicity is probably inactivated by glutathione of the erythrocytes. (Author abstract by permission)

77-0870. Lofroth, G.; Wennerberg, R. (Radiobiol. Dep., Univ. Stockholm, Stockholm, Sweden). **Methylation of purines and nicotinamide in the rat by dichlorvos.** *Naturforschung* 29C(9-10): 651; 1975. (11 references)

Two male R strain rats were given 225 μCi of (^{14}c-methyl)-dichlorvos by i.p. injection then allowed free access to food and water. Over the 4 consecutive 24-hr periods, 53, 4.1, 1.2, and 0.7%, respectively of the administered dose was excreted in the urine. During the first 24-hr period, 1.8 nCi was excreted as 1-methylnicotinamide. The combined amounts of 7-methyl-guanine (7-meG) and 3-methyladenine (3-meA) excreted in the four 24-hr periods were 5.8, 3.9, 2.8, and 1.9 nCi, respectively. The relative percentages of 3-meA in the first three periods were 7-8, 4-6, and 3% or slightly less. Thus, the biological half-life for the urinary excretion of the 7-meG formed is about 50 hr. The relatively faster excretion of 3-meA is in accordance with the fact that the rate of loss of 3-meA from DNA is faster than that of 7-meG. The results strongly indicate that dichlorvos methylates nucleic acids in mammals.

77-0871. Bingham, S. W.; Shaver, R. L. (Dep. Plant Pathol. Physiol., Virginia Polytech. Inst. State Univ., Blacksburg, VA 24061). **Diphenamid removal from water and metabolism by aquatic plants.** *Pestic. Biochem. Physiol.* 7(1): 8-15; 1977. (23 references)

Several aquatic plants and algae were effective for removal of *N,N*-dimethyl- 2,2-diphenyl- acetamide ([^{14}C]diphenamid) from water and degradation to various metabolites. Parrotfeather (*Myriophyllum brasiliense* L.) and water hyacinth (*Eichornis crossiper* L.) removed large quantities of diphenamid from water while algae (*Ulothrix* sp., *Oedogonium* sp., *Glococystis* sp., and *Scenedesmus* sp. mixed culture) and waterthread pondweed (*Potamogeton diversifolius* Raf.) were less effective in reducing diphenamid concentration in the water. A somewhat stable metabolite in algae, water hyacinth, and parrotfeather was *N*-methyl- 2,2-diphenyl- acetamide. Algae and water hyacinth degraded diphenamid further to unknown products. One of these compounds moved more slowly than *N*-methyl- 2,2-diphenylacetamide on thin-layer chromatography using benzene, *n*-heptane saturated with water and methanol solvent. While most solvents did not resolve 2,2-diphenylacetic acid from the base, petroleum ether, ethyl ether, and formic acid (50:50:2, v/v/v) was found to move 2,2-diphenylacetic acid further than diphenamid or *N*-methyl -2,2-diphenylacetamide on thin-layer chromatography.

77-0872. Ludke, J. L. (Patuxent Wildl. Res. Ctr., Laurel, MD 20811). **DDE increases the toxicity of parathion to coturnix quail.** *Pestic. Biochem. Physiol.* 7(1): 28-33; 1977. (19 reference)

Adult male Japanese quail (*Coturnix coturnix*) were exposed to DDE or chlordane in the diet and subsequently dosed with parathion or paraoxon. Pretreatment with 5 or 50 ppm DDE in the diet for 12 weeks resulted in increased cholinesterase (ChE) activity in plasma, but not in the brain. Dietary concentrations of 5 and 50 ppm DDE caused increased suseptibility of quail that were challenged with parathion or paraoxon. The increased mortality resulting from DDE pretreatment was reflected in brain ChE inhibition. The synergistic action of DDE was apparent after 3 days of exposure to 50 ppm DDE and 1 week of exposure to 5 ppm DDE. Birds exposed for 3 weeks to 5 or 50 ppm DDE retained their DDE-potentiated sensitivity to parathion after 2 weeks on clean diet. Chlordane pretreatment resulted in decreased susceptibility (antagonism) to parathion, but not to paraoxon dosage. Implications of differing responses in ChE and mortality among controls, DDE-, and chlordane-pretreated birds after parathion or paraoxon dosage are discussed.

77-0873. Paulson, G. D.; Jacobsen, A. M.; Zaylskie, R. G. (Metab. Radiation Res. Lab., Agric. Res. Serv., Farga, ND 58102). **Herbicide perfluidone (1,1,1-trifluoro-*N*-(2-methyl-4-(phenylsulfonyl)phenyl methanesulfonamide): its metabolism in rats and chickens.** *Pestic. Biochem. Physiol.* 7(1): 62-72; 1977. (7 references)

Rats and chickens were each given a single oral dose (10 or 100 mg/kg body wt) of 1,1,1-trifluoro-*N*-[2-

methyl-4- (phenylsulfonyl)phenyl- $^{14}C(UO)$methanesulfonamide ([^{14}C] perfluidone). Depending on the dose, from 8.4 to 36.2% of the [^{14}C] was eliminated in the urine and from 36.4 to 85.4% was eliminated in the feces within 48 hr after dosing. Less than 1% of the [^{14}C] given to laying hens at [^{14}C]perfluidone was present in the eggs produced during the first 96 hr after dosing. The percentage of the administered [^{14}C] that remained in these animals (body with G.I. tract and contents removed) varied from 0.34 (96 hr after dosing) to 1.68% (48 hr after dosing). ^{14}C-labeled compounds in the urine and feces from the rats and chickens were purified by solvent extraction, column chromatography, and gas-liquid chromatography, and then identified by infrared and mass spectrometry. The parent compound was the major ^{14}C-labeled component in the urine and feces of both animals. 1,1,1-Trifluoro-*N*- [2-methyl-4- (3-hydroxyphenylsulfonyl) phenyl] methanesulfonamide was present in the feces of both animals. The proposed structures of other metabolites were 1,1,1-trifluoro-*N*- hydroxy-*N*- [2-methyl-4-(phenylsulfonyl) phenyl] methanesulfonamide (rat urine) and 1,1,1-trifluoro-*N*- [2methyl-4- [(methylsulfonyl)-phenylsulfonyl] phenyl methanesulfonamide (chicken urine).

77-0874. Nelson, J. O.; Kearney, P. C.; Plimmer, J. R.; Menzer, R. E. (Dep. Entomol., Univ. Maryland, College Park, MD 20742). **Metabolism of trifluralin, profluralin, and fluchloralin by rat liver microsomes.** *Pestic. Biochem. Physiol.* 7(1): 73-82; 1977. (16 references)

Three structurally related [^{14}C]dinitroaniline herbicides, trifluralin, profluralin, and fluchloralin, were extensively metabolized *in vitro* by both normal and phenobarbital-induced rat liver microsomes. Identification of the metabolites in the ethyl acetate extracts indicated that aliphatic hydroxylation, *N*-dealkylation, reduction of a nitro group, and cyclization were the predominant metabolic routes for these herbicides *in vitro*. Of particular interest was the formation of a benzimidazole metabolite.

77-0875. Kao, T. S.; Fukuto, T. R. (Div. Toxicol. Physiol., Dep. Entomol., Univ. California, Riverside, CA 92502). **Metabolism of *O,S*-dimethyl propionyl- and hexanoylphosphoramidothioate in the house fly and white mouse.** *Pestic. Biochem. Physiol.* 7: 83-95; 1977. (18 references)

The metabolism of *O,S*-dimethyl propionyl- and hexanoylphosphoramidothioate was investigated in the white mouse and house flies. Compared to the hexanoylphosphoramidothioate, the propionyl analog is approximately 35-fold more toxic to house flies and is 10-fold less toxic to mice. On a percentage basis, substantially larger amounts of methamidophos were detected in house flies treated topically with the propionylphosphoramidothioate than in flies treated with the hexanoyl derivative. The reverse was evident in the case of the mouse where much larger amounts of methamidophos were formed after oral treatment with the hexanoylphosphoramidothioate. Minor amounts of other metabolic products also were detected, including an unknown from the hexanoylphosphoramidothioate. Metabolism of the *S*-methyl moiety to carbon dioxide appeared to be a major pathway for metabolic degradation of both compounds in both the white mouse and house fly. The difference in toxicity of the two acylphosphoramidothioates to the mouse and house fly is attributed to difference in the amounts of methamidophos formed in the animals.

77-0876. Crayford, J. V.; Harthoorn, P. A.; Hutson, D. H. (Shell Res. Ltd., Tunstall and Woodstock Labs., Sittingbourne Res. Cent., Sittingbourne, Kent, England). **Excretion and residues of the herbicides benzoylprop-ethyl, flamprop-isopropyl and flamprop-methyl in cows, pigs and hens.** *Pestic. Sci.* 7(6): 559-570; 1976. (8 references)

Two wild oat herbicides, benzoylprop-ethyl and flamprop-methyl were administered to lactating cows at low levels (0.3-3.0 mg/kg in total diet) and the excretion of total metabolites in milk, urine and feces was measured. Total residues in tissues were also determined. Similarly a third and related herbicide flamprop-isopropyl was fed to cows, pigs and hens (at 0.5 mg/kg in total diet) and the residues were determined in excreta and tissues, including eggs. The amounts of the compounds fed were equivalent to approximately 10-300 times the total residue found in cereal treated in the field. Residues in milk in most cases were well below 0.001 mg/kg; in muscle samples < 0.003 mg/kg; and in eggs, 0.0008 mg/kg, decreasing by 50% in approximately 3 days to 0.0001 mg/kg 4 days after the termination of treatment. Elimination of the herbicides from the animals was rapid in every case and this, together with the low residue levels, was attributed to very efficient metabolic de-esterification to the parent carboxylic acid metabolites (benzoylprop and flamprop). These metabolites possess physical properties ideally suited for excretion via the kidneys and bile into urine and feces and, conversely, unsuited for transport into milk and eggs. (Author abstract by permission)

77-0877. Baldwin, M. K.; Crayford, J. V.; Hutson, D. H.; Street, D. L. (Shell Res. Ltd., Tunstall Lab., Sittingbourne Res. Cent., Sittingbourne, Kent, England). **The metabolism and residues of ^{14}C-endrin in lactating cows and laying hens.** *Pestic. Sci.* 7(6): 575-594; 1976. (18 references)

[^{14}C]Endrin was fed to two lactating cows in a portion of their diet for 21 days. The intake was equivalent to approximately 0.1 mg of endrin per kg of total diet. Excretion of radioactivity in milk, urine and feces reached equilibrium with intake between 4 and 9 days after starting treatment. Milk residues reached 0.003-0.006 mg/kg, were composed of unchanged endrin and were located in the fat. Muscle residues reached 0.001-0.002 mg/kg. Residues in the fat reached a maximum of 0.1 mg/kg and were due to unchanged endrin. [^{14}C]Endrin was administered in corn

oil to six laying hens for 21 weeks. The intake was equivalent to approximately 0.13 mg/kg of total diet. Ingestion and excretion were almost in balance at 16-20 weeks. Egg residues reached 0.11-0.18 mg/kg were composed of unchanged endrin and were located in the yolk. Tissue residues were 0.01 mg/kg in breast, 0.1 mg/kg in leg, 0.17 mg/kg in kidney, 0.47 mg/kg in liver and 1.0 mg/kg in fat. The residues were accounted for as unchanged endrin except in liver and kidney in which part was probably due to polar metabolites in the process of excretion. The results show that endrin is much more rapidly metabolized in cows than in hens. The pathways of metabolism were fundamentally the same in both species, the major product being *anti*-12-hydroxyendrin, which was found unconjugated in cow urine and feces and as the *O*-sulfate conjugate in hen excreta. The only observed difference in primary metabolism was some *syn*-12-hydroxyendrin and 12-ketoendrin in cows. This pathway was not detected in hens. (Author abstract by permission)

77-0878. Lee, T. T.; Chapman, R. A. (Res. Inst., Agric. Canada, London, Ontario, Canada N6A 5B7). **Inhibition of enzymic oxidation of indole-3-acetic acid by metabolites of the insecticide carbofuran.** *Phytochemistry* 16(1): 35-39; 1977. (17 references)

Metabolites of carbofuran, a carbamate insecticide, inhibit the enzymic oxidation of indole-3-acetic acid. The metabolites differ in stability and effectiveness. 2,2-Dimethyl- 7-hydroxy- 2,3-dihyrobenzofuran represents one type which is broken down in the IAA oxidation reaction; thus the induced inhibition is limited by depletion of the inhibitor. 2,2-Dimethyl- 3-keto-7-hydroxy- 2,3-dihydrobenzofuran represents the other type which is stable in the reaction; thus the inhibition is persistent. With both types of inhibitors the inhibition is reversible by higher substrate concentrations, but the Lineweaver-Burk plot is curvilinear suggesting the complex nature of competitive inhibition.

77-0879. Rankov, V. (Author address not given). **Pestitsidite i biologichnata fiksatsiia na atmosferen azot.** [**Pesticides and biological fixation of atmospheric nitrogen.**] *Priroda (Sofia)* 23(3): 77-79; 1974. (Bulgarian)

Studies on the effects of pesticides on nitrogen-fixing soil microorganisms are reviewed. Arezine, aretit, aphalone, bulpur, gramoxone, dimide, Kamparal 1803, lindane, prometryne, ramrod, reglone, semeron, treflan, TOK-E 25, heptachlor, Dowfume, edabrome, Terracure, simazine, atrazine, diuron, 2,4-D, neburon, propazine, secon, phalone, and fenuron were found not to influence Azotobacter when applied in the recommended doses. Many pesticides are harmless even in higher doses. Atrazine, 2,4-D, simazine, MCPA, and dimide stimulate Azotobacter. Dinosol 50, tillam, TCA and vapam inhibit Azotobacter. *Clostridium pasteurianum* is not inhibited by prometryne, aphalone, arezine, dimide, simazine, alipur, Prevenol 56, Kamparol (A-1803), bulpur, and treflan. Certain species of nodule bacteria are susceptible to high doses of pesticides.

77-0880. Subba Rao, D. S. V.; Glick, B. (Dep. Poultry Sci., Mississippi Agric. Forest Exp. Stn., Mississippi State Univ., Mississippi State, MS 39762). **Pesticide effects on immune responses and metabolic activity of chicken lymphocytes.** *Proc. Soc. Exp. Biol. Med.* 154(1): 27-29; 1977. (27 references)

Immune response and metabolic activity of bursal, splenic, and thymic lymphocytes from chickens treated with DDT and Mirex were evaluated. The results indicated a marked reduction in the metabolic activity upon pesticide treatment. There was no significant difference in total antibody production, but IgG levels were significantly reduced and IgM levels were markedly elevated. The significance of reduced metabolic activity and IgG production were discussed in relation to T-cell activity.

77-0881. Durand, R. E.; Biaglow, J. E. (Radiobiol. Res. Lab., Dep. Human Oncol. Radiol., Wisconsin Clin. Canc. Cent., Madison, WI 53706). **Radiosensitization of hypoxic cells of an in vitro tumor model by respiratory inhibitors.** *Radiat. Res.* 69(2): 359-366; 1977. (15 references)

Three inhibitors of mammalian cell respiration, rotenone, antimycin A, and oligomycin, were tested for their effects on the oxygen utilization and radiation response of multicell spheroids. All three agents rapidly inhibited the oxygen utilization of peripheral cells of intact spheroids, leading to a progressive increase in radiosensitivity as oxygen reached the centrally located cells. Virtually complete reoxygenation of the spheroid cells was observed with only 0.12 μM rotenone, whereas a similar radiation response with antimycin A or oligomycin required concentrations of 10 and 250 μM, respectively.

77-0882. Sochilina, E. E.; Samokish, V. A. (I. M. Sechenov Inst. Evol. Physiol. Biochem., Leningrad, USSR). **Pobochyne reaktsii pri vzaimodestvii fosfororganicheskikh ingibitorov s kholinesterazami.** [**Side reactions during the interactions of organophosphorus inhibitors with cholinesterases.**] *Reakts. Sposobnost Org. Soedin.* 10(4): 999-1004; 1973. (7 references) (Russian)

The values of the difference between initial and final concentrations of some phosphororganic inhibitors (POI) have been measured for their reactions with cholinesterases. For interaction between POI's and acetylcholinesterase the POI concentrations difference values were shown to be much higher than enzyme active concentration, thus indicating side reactions; the effect was strongly dependent on the POI chemical structure.

77-0883. Pohl, L. R.; Bales, R.; Trager, W. F. (Dep. Pharm. Chem., Univ. Calif., San Francisco, CA 94143). **Warfarin, stereochemical aspects of its metabolism in vivo in**

the rat. *Res. Commun. Chem. Pathol. Pharmacol.* 15(2): 233-256; 1976. (28 references)

The biotransformation of the *R* and *S* isomers of warfarin was investigated in the rat. The formation of 7-hydroxywarfarin was stereoselective for the *R* enantiomer, while the formation of 4′-hydroxywarfarin was stereoselective for the *S* enantiomer. The 6-, 8-, and benzylic hydroxylation of both isomers was approximately the same. The reduction of the side chain ketone function of warfarin to the corresponding diastereomeric warfarin alcohols was stereoselective for the *S* isomer. The reduction also displayed a degree of stereospecificity with *S* reduction occurring predominantly. The results of the *in vivo* study agree in many cases with a previous *in vitro* investigation. However, differences between the *in vitro* and *in vivo* studies do exist and suggest that secondary stereoselective biotransformation routes occur *in vivo* and that the microsomal and soluble enzymes employed in the *in vitro* study may have been disrupted during isolation. Large amounts of polar labile conjugates of *R* and *S* warfarin, and metabolites were found in the urine. The 4-hydroxyl group of the coumarin ring appears to be the position of conjugation and this process appears to be regio and stereoselective.

77-0884. Vettorazzi, G. (Food Addit. Unit, World Health Organ., Geneva, Switzerland). **State of the art of the toxicological evaluation carried out by the joint FAO/WHO meeting on pesticide residues. II. Carbamate and organophosphorus pesticides used in agriculture and public health.** *Residue Rev.* 63: 1-44; 1976. (26 references)

The criteria for evaluation of cholinesterase-inhibiting substances and other important aspects which have been taken as the basis for formulating toxicological decisions on carbamates and organophosphorus pesticides have been reviewed in the light of relevant published documents resulting from the activities of the Joint Meeting of the FAO Working Party of Experts on Pesticide Residues and the WHO Expert Committee on Pesticide Residues. In the second part of this review article, short toxicological summaries or profiles reiterate in broad terms the current thinking on the toxicity of the carbamate and organophosphorus compounds considered by the Joint Meeting from the outset of its activities in 1963 up to and including 1974. When appropriate, reference has also been made to the major conclusions of the expert bodies in the World Health Organization on the same topic. This paper is the second of a series of general reviews which comprise the major categories of pesticide chemicals examined by the Joint Meeting. (Author abstract by permission)

77-0885. Marcot, B.; Dore, J. C.; Munavalli, S.; Viel, C. (Cent. Etudes Rech. Chim. Organ. Appl., C.N.R.S., Thiais, France, 94320). **Recherche en chimiotherapie antitumorale. VIII. Activite antitumorale in vitro d'acides regulateurs de la croissance vegetale, d'analogues et de certains derives.** [**Antitumor chemotherapy. VIII. Antitumor activity in vitro of plant growth regulator acids, their analogs, and derivatives.**] *Rev. Roum. Chim.* 20(1): 91-106; 1975. (84 references) (French)

The cytotoxic effects of chloro-, dichloro-, methoxy-, and dimethoxy- phenylacetic acid isomers, of some of their amides and esters, and of some chloromethoxy- phenylacetic and phenylpropionic acids were studied in vitro on tumor cells from a single clone of BHK 21/13 hamster fibroblasts and from the RB 12 hamster clone. A weak cytotoxic effect was observed only at concentrations of about 200 μM/liter. Results were the same with the indolyl-acetic, chloro-4, and dichloro-2,4-phenoxyacetic acids, their amides, diethylaminoethylamides, and corresponding esters tested for comparative purposes.

77-0886. Bashmurin, A. F. (Dep. Pharmacol. Toxicol. Leningrad Inst. Vet. Med., Leningrad, USSR). **Izuchenie toksichnosti atrazina na zhivotnykh.** [**Toxicity of atrazine for animals.**] *Sb. Rab. Leningr. Vet. Inst.* 36: 5-7; 1974. (Russian)

The effect of atrazine on various animal species was studied. The acute oral LD50 was determined to be 1.75 mg/kg in albino mice, and 3.0 mg/kg in albino rats. Excitation and subsequent depression were the poisoning symptoms. The animals died in 10-40 hr. The cumulation factor, determined by the oral administration of 1/6 LD50 to albino mice for 16-20 days, is 3.2. The ingestion of food with 1 g/kg atrazine for a prolonged time caused 100% mortality. Atrazine, administered to cats orally in a dose of 0.1 g/kg in the form of 1% solution, caused a considerable drop in blood pressure, which normalized in 3-5 min. Administered to dogs in a dose of 0.1 g/kg, atrazine had a pronounced antidiuretic effect. Atrazine inhibited the cholinesterase activity in the brain tissue by 20-35%.

77-0887. Carlson, D. A.; Konyha, K. D.; Wheeler, W. B.; Marshall, G. P.; Zaylskie, R. G. (Insects Affecting Man Res. Lab., Agric. Res. Serv., U.S. Dep. Agric., Gainesville, FL). **Mirex in the environment:its degradation to kepone and related compounds.** *Science* 194(4268): 939-941; 1976. (14 references)

The chlorocarbon mirex undergoes slow, successive loss of chlorine in the field to a series of related compounds that had lost one or more chlorine atoms. Soil samples were recovered 12 years after treatment at 1 part per million (ppm), and ant bait was recovered 5 years after an aircraft crash. As much as 50 percent of the original mirex was recovered at levels of about 0.5 and 640 ppm, respectively. Kepone was present at levels of 0.02 ppm in soil and 10 ppm in the bait or up to 10 percent of the recovered mirex, as determined by combined techniques of chromatography and mass spectrometry. This constitutes the first observation of the degradation of mirex in nature, and demonstrates a pathway for its eventual disappearance from the environment. (Author abstract by permission)

77-0888. Tanimura, T. (Sch. Anat., Fac. Med., Kyoto Univ, Kyoto, Japan). [**Teratogenicity of chemicals.**] *Shonika (Pediatr. Jpn.)* 17(5): 357-367; 1976. (27 references) (Japanese)

After defining chemical teratogenicity, the general principles of teratogenicity such as the specificity of teratogen, critical period of teratogenic action, the dose-effect relationship, the difference of gene types between mother and fetus, and the physiological and pathological states of mothers were described. As for the chemicals whose teratogenicity has come into question, organomercurials and 2,4,5-T were tabulated as pesticides among other chemicals. The significance and problems of animal experiments were mentioned. The Japanese official standards for teratogenicity testing of drugs include (1) administration before and at the early stage of pregnancy, (2) administration during fetal organ-formation stage and (3) administration in the perinatal and lactation stage using rodent and non-rodent species. Japanese law requires a multigeneration study for registration application of agricultural pesticides, including herbicides. The importance of experimental animal selection and continued observation after birth were described. Epidemiological studies for human teratogenesis are an urgent problem in Japan.

77-0889. Lohs, K.; Fischer, G. W.; Dedek, W. (Forschungsst. Chem. Toxikol., Akad. Wiss. DDR, Leipzig, DDR). **Chemische-toxikologische Aspekte des Alkylierungsvermogens pestizider Phosphorsaureester.** [**Chemical-toxicological aspects of the alkylating properties of pesticidal organophosphates.**] *Sitzungsber. Akad. Wiss. DDR* (11 N): 1-58; 1976. (160 references) (German)

Studies on the alkylating, mutagenic, teratogenic and carcinogenic effects of herbicidal organophosphates are reviewed. Dichlorvos, trimethyl phosphate, triethyl phosphate, bidrin, dimethoate, oxydemeton methyl, methyl parathion, trichlorfon, and parathion were found to have genetic effects. Trichlorfon and dimethoate induced tumors in experimental animals. Most of the pesticidal organophosphates tested considerably inhibited both DNA synthesis and DNA repair in concentrations well below the toxicity threshold. Therefore, the late damages due to organophosphate pesticides may be mainly due to the complete or partial inhibition of DNA repair. The cause of late damage by organophosphorus pesticides will have to be clarified by epidemiological and catamnestic studies on subjects having been exposed to such substances for a long time. They should be investigated especially for diseases of the respiratory tract, gastrointestinal tract, hematopoietic system, and nervous system, concerning fertility and cancer incidence.

77-0890. Nelson, L. M., Jr.; Hedrick, H. G. (Coll. Life Sci., Louisiana Tech. Univ., Ruston, LA 71270). **Influence of an experimental herbicide on soil nitrogen-fixing bacteria and other microorganisms.** *Soil Sci.* 122(4): 206-215; 1976. (22 references)

Influence of an experimental herbicide on two isolates of soil nitrogen-fixing bacteria *Rhizobium japonicum* 3I1b110 and *Azotobacter vinelandii* ATCC 12837, was determined using a bioresponse assay, thin-layer chromatographic analysis, and changes in viable cells on the herbicide as the sole source of organic carbon. Seven bacterial and nine fungus isolates were also found by a soil enrichment technique to show utilization of the herbicide. *A. vinelandii* showed stimulation of growth in the first 4 days of exposure on the herbicide at 1,000 ppm. The herbicide then became toxic or was metabolized into toxic by-products. *R. japonicum* showed utilization of the herbicide by changes in growth rate as influenced by the inoculum concentration, the thoroughness of inoculum washing, and the concentration of herbicide. Using TLC assay techniques, the herbicide was found to be depleted in laboratory experiments by *R. japonicum* following 10 days of growth, without detectable nonmetabolic by-products. These findings suggested that the addition of the experimental herbicide to soils planted with bean crops could possibly influence the metabolic activity of *R. japonicum* as a symbiotic nitrogen-fixing bacterium.

77-0891. Wolf, D. C.; Martin, J. P. (Dep. Agron., Univ. Maryland, College Park, MD). **Decomposition of fungal mycelia and humic-type polymers containing carbon-14 from ring and side-chain labeled 2,4-D and chloropropham.** *Soil Sci. Soc. Am. J.* 40(5): 700-704; 1976. (33 references)

Hendersonula toruloidea and *Stachybotrys atra* were grown on a liquid peptone-dextrose medium containing 10 ppm ring- or side-chain 2-^{14}C labeled 2,4-D (2,4-dichlorophenoxyacetic acid), or chlorpropham (isopropyl *m*-chlorocarbanilate). Approximately 12% of the activity from ring-^{14}C 2,4-D was present in the humic polymers produced by the fungi, and 4 to 16% was recovered in the mycelia. The mycelia of both fungi contained approximately 35% of the activity from either ring- or 2-^{14}C chlorpropham and the humic polymers from 3 to 24% of the added activity. The decomposition percentages of the ^{14}C portions of *H. toruloidea* and *S. atra* from ring-^{14}C 2,4-D were 15 and 35% and 13 and 35%, respectively, for the mycelia and humic polymers. The label from 2-^{14}C 2,4-D was released as $^{14}CO_2$ at rates greater than twice that for the ring-^{14}C 2,4-D. Similarly, the carbon from ring-^{14}C chlorpropham associated with *H. toruloidea* and *S. atra* mycelia and humic polymers was more resistant to decomposition than that from 2-^{14}C chlorpropham. The results indicate that 2,4-D and chlorpropham or more probably their partial degradation products may be incorporated into microbial cells or products, some of which are relatively resistant to microbial degradation.

77-0892. Horiguchi, Y.; Yanagisawa, T.; Sasaki, K.; Ide, H.; Ueki, S.; Abe, E.; Kurosawa, K. (Jpn. Inst. Rural Med., Saku Gen. Hosp., Usuda, Nagano, Japan). [**Neurological studies on the treatment of intoxication by organophosphorus compounds. Part 5 (Section 1. Animal**

experiments).] *IN: Studies of the Effects of Pesticides on Living Organisms* 1976, p. 67-68. (Japanese)

Acute effects of diazinon on the central nervous system of white rabbits were studied by EEG and EKG. Diazinon was injected once into the auricular vein 50% olive oil solution. In the EEG, 10 min after administration localized spikes appeared in the hippocampus and sometimes in the amygdaloid nucleus, and continued for some time. However, the spikes did not propagate over the brain. In the EKG, a tendency to bradycardia appeared before the change in EEG. This later disappeared and the EKG showed a slightly greater stability. The effect of diazinon seemed to to be relatively delayed.

77-0893. Torstensson, L. (Dep. Microbiol., S-750 07 Uppsala 7, Sweden). **Effects of bentazon and dinoseb on soil microorganisms and on the Rhizobium-Leguminosae symbiosis.** *Swed. J. Agric. Res.* 5(4): 177-183; 1975. (30 references)

The effects of bentazon and dinoseb were studied on pure cultures of *Azotobacter chroococcum, Rhizobium leguminosarum, R. meliloti, R. phaseoli, R. trifolii* and on the functional groups of proteolytic organisms, ammonifiers, nitrifiers, denitrifiers, sulphate reducers and cellulolytic organisms. Dinoseb—at any rate in high doses—had unfavorable effects on all the microorganisms tested. Where dinoseb had unfavorable effects, bentazon often had none at all. Where bentazon does have an effect—as on *Nitrosomonas, Nitrobacter*, sulphate reducers and cellulolytic organisms—it is at doses many times larger than normal field application ones. In addition, the effects of bentazon, dinoseb and MCPA on the Rhizobium-Leguminosae symbiosis for lucerne, white clover, field bean and pea were investigated. Bentazon and dinoseb had approximately the same effect on symbiosis expressed in terms of nitrogen fixation and dry matter production by the plants. The effects of MCPA appear at doses at least ten times lower than for the other two herbicides.

77-0894. Seefeld, F.; Beitz, H.; Bohlemann, H. J. (Inst. Pflanzenschutzforsch. Kleinmachnow, DDR Akad. Landwirtsch., Kleinmachnow, DDR). **Ueber die Beeinfluessung der Rueckstandsdynamik von Akariziden durch moderne Applikationsverfahren im Gurkenanbau. [Control of acaricide residue dynamics by modern methods of application to cucumber plots.]** *Tagungsber. Akad. Landwirtschaftswiss. DDR* 126 S: 69-77; 1974. (7 references)

Experiments were performed to determine what time periods must be allowed between the spraying of cucumbers in greenhouses with dicofol or dimethoate and harvesting. Following Milbol EC and Bi 58 spraying, as well as FIP and Milbol EC high-temperature atomization, active principles were readily degraded, with the initial residues smaller after the latter method. Three days waiting after either application variant of dicofol and four days after spraying or three days after high-temperature atomization for dimethoate were found to be satisfactory.

77-0895. Larsson, K. S.; Arnander, C.; Cekanova, E.; Kjellberg, M. (Lab. Teratology, Karolinska Inst., Stockholm, Sweden). **Studies of teratogenic effects of the dithiocarbamates maneb, mancozeb, and propineb.** *Teratology* 14: 171-184; 1976. (18 references)

Oral administration of high dosages of the dithiocarbamate pesticides maneb and mancozeb was teratogenic in rats but not in mice. The malformations, severe limb and craniofacial defects, were pronounced after maneb treatment but less so after mancozeb and propineb, zinc-containing compounds. The teratogenic effect of maneb was progressively reduced by simultaneously administering increasing amounts of zinc acetate. The mechanism of the teratogenic effect may involve the compounds being chelating agents, trapping zinc required for many important enzyme systems. (Author abstract by permission)

77-0896. Sakurai, K.; Kasai, T. (Biol. Res. Cent., Nihon Nohyaku Co. Ltd., Osaka, Japan). **Teratological studies of isoprothiolane in mice.** *Teratology* 14(2): 251; 1976.

Teratogenic effect of isoprothiolane (Fuji-one), a new fungicide for rice plants was investigated. Groups of pregnant mice were fed with diets containing 0 (control), 100 or 1000 ppm isoprothiolane throughout the pregnancy period. Another group received an oral dose of 600 mg/kg/day on days 6 - 12 of gestation. Decrease in fetal body weight and number of ossified caudal vertebrae, and increased arches were observed in the 600 mg/kg/day group. Two fetuses with polydactylia were observed in a litter in the 1000 ppm group, but they showed no dose-response relationship and were considered spontaneous. No other skeletal or soft-tissue malformations were observed in test groups. In the postnatal study, the external differentiation and behavior were normal and no skeletal and soft-tissue malformations were observed. It is concluded that isoprothiolane is not teratogenic to the mouse. (Author abstract by permission)

77-0897. Schreiweis, D. O.; Murray, G. J. (Dep. Biol. Sci., Univ. Nevada, Las Vegas, NV). **Cardiovascular malformations in *Oryzias latipes* embryos treated with 2,4,5-trichlorophenoxyacetic acid (2,4,5-T).** *Teratology* 14(3): 287-390; 1976. (24 references)

Exposure of fertilized *Oryzias latipes* eggs to concentrations of 2,4,5-trichlorophenoxyacetic acid up to 14 ppm had no gross developmental effects. Exposure to concentrations above 14 ppm resulted in multiple malformations of the heart and blood vessels. Embryos failed to hatch when exposed to concentrations above 25 ppm. (Author abstract by permission)

77-0898. Landauer, W. (Dep. Hum. Genet. Biometry, Univ. Coll. London, London, England). **Cholinomimetic teratogens. V. The effect of oximes and related cholinesterase reactivators.** *Teratology* 15(1): 33-42; 1977. (37 references)

Pyridine-2-aldoxime methiodide and pyridine-2-aldoxime methyl methane sulfonate (P2S), used as supplements to carbachol or neostigmine, greatly lowered the incidence in chicken embryos of vertebral defects and muscular hypoplasia. With 4-pyridine aldoxime the effect of the teratogens was less reduced. Supplementation of carbachol or neostigmine with either ambenonium or toxogonin lessened the occurrence of muscular hypoplasia, but did little, if anything, to prevent malformation of the neck vertebrae. In tests with physostigmine P2S as supplement reduced or prevented cervical defects, but failed to protect the nicotinamide-sensitive parts of the embryo. (Author abstract by permission)

77-0899. Schom, C. B.; Abbott, U. K. (Univ. New Brunswick, Fredericton, New Brunswick, Canada). **Temporal, morphological, and genetic responses of avian embryos to azodrin, an organophosphate insecticide.** *Teratology* 15(1): 81-88; 1977. (33 references)

The effect of Azodrin on avian development was studied using a bobwhite quail line and two chicken lines—a single comb White Leghorn (SCWL) and an Australorp line. The bobwhite quail embryos did not respond to injections of Azodrin until stages 22 to 23 (6 days of incubation); the SCWL embryos, not until stage 18 (3 days of incubation) with increasing susceptibility through stage 20. The threshold concentration, at stage 19, for the SCWL was 0.4 mg/kg, for the Australorp less. Within one hour of treatment stage-20 embryo shape was altered. There was, however, no immediate response from embryos treated earlier. The effect appeared as a reduced growth rate in the cervical flexure, and may be mediated by interference with the normal energy balance. The response, once initiated, was continuous through 10 days of incubation. (Author abstract by permission)

77-0900. Barham, S. S.; Brinkley, B. R. (Univ. Texas Med. Br., Galveston, TX). **The effect of rotenone on the cell cycle kinetics, the mitotic spindle, and respiratory activity in cultured mammalian cells.** *Texas Rep. Biol. Med.* 33(4): 554-557; 1975.

Rotenone has been extensively used as a pesticide and in the laboratory as a specific inhibitor of the mitochondrial respiratory chain. The drug has also been demonstrated to be an effective antimitotic agent in mammalian cell culture. Until this report, the cellular biochemical mechanism by which rotenone effectively blocks cells in mitosis has not been clearly established. Rotenone may elicit mitotic arrest by either inhibiting a specific energy-requiring step for completion of mitosis or by blocking the assembly of the mitotic apparatus. By employing a combination of techniques and assays including cell kinetics studies, oxygen consumption and viscosity measurements, and light and electron microscopy, the mechanism by which rotenone arrests cells in mitosis has been determined. The mechanism is analogous to that possesed by colchicine, colcemid, and related antimitotic drugs that bind specifically to tubulin, the microtubule protein. However, rotenone elicits progressive delay in all phases of the cell cycle, apparently as a direct result of respiration inhibition. Amytal, a compound functionally similar to rotenone, failed to effectively block cells in mitosis. The rate of oxygen consumption by a population of Chinese hamster cells in exponential growth was reduced 87% by rotenone and 80% by amytal from control levels. Thus, rotenone appears to exert a dual effect on events of the cell cycle.

77-0901. Hayes, W. J., Jr. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN). **Dosage relationships associated with DDT in milk.** *Toxicol. Appl. Pharmacol.* 38(1): 19-28; 1976. (29 references)

Separate reports imply that DDT is more toxic to infant rats if they receive it via their mothers' milk rather than via stomach tube. Therefore, the effect of DDT in milk was reinvestigated, and the study was expanded to include dosage-response measurements. The results were consistent with earlier findings that young rats are no more susceptible than adults to poisoning by DDT and may be more resistant, depending on circumstances. A comparison of isomers and potential metabolites in technical DDT and in tissues indicated either lack of absorption or rapid excretion of *o,p'*-isomers, resistance of the blood-brain barrier to *o,p'*-DDT, and the increase of DDD and DDE through metabolism. The concentration of DDT in the brains and whole bodies of pups from dams dosed at 200 mg/kg/day was higher than would be predicted by extrapolation from lower oages, suggesting relative inability to the dams to metabolize and eliminate the compound at a dosage fetal to some of them. However, the highest brain level for a pup that died following dosing of its mother was 44 ppm, compared to 83 ppm (the highest level for a surviving pup of the same kind) and compared to 132-177 ppm (the range for pups killed by DDT administered to them by stomach tube). A slight deficiency of weight gain and significantly less stomach contents of pups of mothers treated at 200 mg/kg/day indicated their relative failure to feed although their mothers produced adequate milk. Based on the concentration of DDT in rat milk and on the amount of DDT measured in litters fed exactly 24 hr, it was calculated that rats secreted milk at the rate of 26.6 and 34.5 ml/dam/day when DDT was administered ip and op, respectively. Based on the analyses of litters, the dams secreted into their milk 12.6% to 30.2% of the DDT administered to them, the mean being 24.6% in those receiving the compound from their diet at an average rate of 32.4% mg/kg/day. The concentration of DDT in the milk of rats receiving DDT at a dietary level of 200 ppm was far higher than any level reported for human milk. Infants are in no

danger from DDT in their mothers' milk unless the dosage of the mother is one that approaches, or perhaps reaches, a level toxic to her. (Author abstract by permission)

77-0902. Fabacher, D. L.; Hodgson, E. (Toxicol. Program, Dep. Entomol., North Carolina State Univ., Raleigh, NC). **Induction of hepatic mixed-function oxidase enzymes in adult and neonatal mice by kepone and mirex.** *Toxicol. Appl. Pharmacol.* 38(1): 71-77; 1976. (17 references)

The effects of 1, 10, and 50 ppm dietary kepone (chlordecone) on hepatic mixed-function oxidases of adult male mice were measured. After 14 days dose-dependent increases in liver weight, hepatic microsomal proteins, cytochrome P-450, Type I and Type II ligand binding to cytochrome P-450 and *O*- and *N*-demethylathion of *p*-nitroanisole and aminopyrine were observed. Induction was approximately two-fold for all parameters measured at the 50-ppm level. The results obtained suggest that kepone is a nonspecific inducer, the no-effect level for induction based on *O*-demethylase activity in mice being less than 10 ppm. Body weight gain decreased in mice treated with 50 ppm kepone for 14 days. The effects of kepone and mirex (dechlorane) fed to the mother after parturition on hepatic tissue of male and female neonatal mice were also measured. It is suggested that the increases observed in *O*- and *N*-demethylation of *p*-nitroanisole and aminopyrine in hepatic tissue from neonates result from the transfer of kepone and mirex through the milk. Induction in neonates was greater than that observed in adult male mice treated with kepone. (Author abstract by permission)

77-0903. Chernoff, N.; Rogers, E. H. (Exp. Biol. Div., Health Eff. Res. Lab., United States Environ. Prot. Agency, Research Triangle Park, NC). **Fetal toxicity of kepone in rats and mice.** *Toxicol. Appl. Pharmacol.* 38(1): 189-194; 1976. (5 references)

Doses of 10, 6, and 2 mg/kg/day of Kepone (chlordecone) in CD rats and 12, 8, 4, and mg/kg/day in CD-1 mice were administered to pregnant animals by gastric intubation during the major period of organogenesis, Days 7—16 of gestation. Fetal toxicity was produced in both rats and mice at doses which caused significant reductions in maternal weight gains during gestation and increased liver/body weight ratios. In rats, fetuses from dams receiving the highest dose (which also resulted in 19% maternal mortality) exhibited significant incidences of reduced fetal weight, reduced degree of ossification, edema, undescended testis, enlarged renal pelvis, and enlarged cerebral ventricles. Lower dose levels which also produced maternal weight loss and liver/body weight ratio increase, but no mortality, caused only reduced fetal weight and reduced degree of ossification. Male rats born to dams treated with Kepone during gestation showed no reproductive impairment. In the mouse, fetotoxicity only occurred in the highest dose group and was manifested by increased fetal mortality and clubfoot. (Author abstract by permission)

77-0904. Koschier, F. J.; Berndt, W. O. (Dep. Pharmacol. Toxicol., Univ. Mississippi Med. Cent., Jackson, MS). **Specificity of 2,4,5-trichlorophenoxyacetate on tetraethylammonium transport.** *Toxicol. Appl. Pharmacol.* 38(2): 297-306; 1976. (26 references)

Renal cortical slices from rats pretreated acutely with 2,4,5-trichlorophenoxyacetate (2,4,5-T) show a reduced ability to transport 2,4-dichlorophenoxyacetate (2,4-D) and tetraethylammonium (TEA). The depression in renal transport is dependent on the 2,4-D or TEA concentration in the incubation medium and is surmountable at high concentrations of 2,4-D or TEA. The steady-state transport of TEA by normal renal slices is inhibited by the organic anion 2,4,5-T, in a dose-related manner. Kinetic analysis of the effect of 2,4,5-T on TEA transport appears to demonstrate that 2,4,5-T is a competitive inhibitor of the steady-state accumulation of TEA. However, the initial influx of TEA was found to be unaffected by 2,4,5-T. The transport of another organic cation, N^1-methylnicotinamide, was depressed only modestly by 2,4,5-T. (Author abstract by permission)

77-0905. Clark, C. R.; Krieger, R. I. (Dep. Environ. Toxicol., Univ. California, Davis, CA). **β-Diethylaminoethyl-diphenylpropyl acetate (SKF 525-A) enhancement of tissue accumulation of aldrin in mice.** *Toxicol. Appl. Pharmacol.* 38(2): 315-323; 1976. (30 references)

Pretreatment of male Swiss-Webster mice given acutely toxic doses of [^{14}C]aldrin (150 mg/kg ip) with SKF 525-A (50 mg/kg ip) resulted in significant increases in the accumulation of radioactivity in blood, brain, kidney, and liver. Elevated levels of radioactivity were seen whether aldrin was injected in dimethylsulfoxide or methoxytriglycol. This effect was not seen at 5 mg/kg SKF 525-A but was dose-related in blood, kidney, and liver at 50 and 100 mg/kg. Whole body measurements of the extent of aldrin biotransformation in mice pretreated with 50 mg/kg SKF 525-A indicate that the effect is probably not related to differences in metabolite formation or excretion. Both the alteration of tissue accumulation and metabolism may be dependent on the route of administration, dose, and pretreatment interval of SKF 525-A, as well as the route of administration and dose of the compound being tested. (Author abstract by permission)

77-0906. Joy, R. M. (Dep. Physiol. Sci., Univ. California, Sch. Vet. Med., Davis, CA). **The alteration by dieldrin of cortical excitability conditioned by sensory stimuli.** *Toxicol. Appl. Pharmacol.* 38(2): 357-368; 1976. (24 references)

Recovery cycle analysis was employed to determine the effects of dieldrin on cortical excitability changes subsequent to stimulus presentation in cats. Amounts of dieldrin which changed cortical cell recovery processes did not affect recovery properties of thalamocortical fibers, indicating that in the cortex synaptic processes are most sensitive to the actions of dieldrin. Dieldrin reduced

or abolished the early facilitative (5-10 msec) and later depressive (40-320 msec) consequences of stimulation on visual cortical responses. Recovery properties in somatosensory, motor and association cortex were also significantly affected. These changes are compatible with a mechanism for dieldrin of decreasing inhibitory or increasing excitatory drives onto cortical cells subsequent to afferent input. It is suggested that the increase in cortical excitability as evidenced by enhanced responses to single stimuli and the markedly altered recovery of cortical excitability following such stimuli can account for many of the convulsive properties of dieldrin and similar insecticides. (Author abstract by permission)

77-0907. Tau, E. T.; Mennear, J. H. (Dep. Pharmacol. Toxicol., Sch. Pharm. Pharm. Sci., Purdue Univ., West Lafayette, IN). **The inhibitory effect of DDT on insulin secretion in mice.** *Toxicol. Pharmacol.* 39(1): 81-88; 1977. (15 references)

A single oral dose of 50 mg/kg of DDT administered to mice 18 hr prior to experimentation was found to reduce glucose tolerance without affecting the basal blood concentration of glucose. Also, the treatment inhibited both D-glucose and tolbutamide-stimulated insulin release by isolated pancreatic islets. Hyperglycemia was not noted during the 18-hr period after DDT. The effect of DDT on glucose tolerance persisted for at least 1 week. Reduced pancreatic secretory activity after DDT administration is consistent with the increased activity of gluconeogenic enzymes as well as decreased glycogen synthetase activity reported by earlier workers. (Author abstract by permission)

77-0908. Ziprin, R. L.; Fowler, S. R. (Vet. Toxicol. Entomol. Res. Lab., Agric. Res. Serv., U.S. Dep. Agric., College Station, TX). **Rosette-forming ability of alveolar macrophages from rat lung: inhibition by hexachlorobenzene.** *Toxicol. Appl. Pharmacol.* 39(1): 105-109; 1977. (10 references)

Adult male rats were fed diets containing 250 ppm hexachlorobenzene. They were maintained on this diet for 8-10 weeks, at which time they were killed and alveolar macrophages were washed from their lungs. The antibody-binding ability (*Fc* receptor activity) of these cells was measured by quantitating the percentage of rosette formation fixed antibody concentrations. Rosette formation by cells recovered from hexachlorbenzene-treated rats was distinctly lower than that from untreated rats. (Author abstract by permission)

77-0909. Atchison, G. J.; Johnson, H. E. (Dep. Fish. Wildl., Michigan State Univ., East Lansing, MI 48823). **The degradation of DDT in brook trout eggs and fry.** *Tr. Am. Fish. Soc.* 104(4): 782-784; 1975. (13 references)

Adult brook trout (*Salvelinus fontinalis*) were fed *p,p'*-DDT-^{3}H; eggs obtained from these fish were fertilized and incubated; and the developmental stages were analyzed for the degree of metabolism of the DDT. About 35% of the *p,p'*-DDT-^{3}H in the eggs at the time of fertilization was converted to *p,p'*-DDE-^{3}H and *p,p'*-DDD-^{3}H by the time of yolk depletion in the fry.

77-0910. Conte, F. S.; Parker, J. C. (Texas Agric. Extension Serv., Dep. Wildl. Fish. Sci., Texas A & M Univ., College Station, TX 77843). **Effect of aerially applied malathion on juvenile brown and white shrimp *Penaeus azectus* and *P. setiferus*.** *Tr. Am. Fish. Soc.* 104(4): 793-799; 1975. (13 references)

During the summer of 1969 the effect of the standard serial application of malathion used in mosquito control (85.7 g/hectare) on juvenile brown and white shrimp, *Penaeus aztecus* Ives and *P. setiferus* (Linnaeus) was examined under field conditions in a saline marsh near West Galveston Bay, Texas. Water samples contained a high concentration of malathion (2.0-3.2 ppb) immediately after application and a progressive reduction thereafter. Shrimp at treated stations exhibited mortalities ranging from 14 to 80%. Malathion concentrations in live shrimp taken from the test sites were consistently higher (0.5-3.2 ppm) than concentrations measured in dead shrimp removed during the same period (0.5-2.1 ppm). No deaths attributable to malathion were observed at the control stations and no detectable traces of malathion were observed in water or shrimp samples removed from the control stations during the experiments. It was concluded that malathion was the most likely contributor to brown and white shrimp mortalities observed at the treated station.

77-0911. Gopal, T.; St. Omer, V.; Oehme, F. W. (Comp. Toxicol. Lab., Coll. Vet. Med., Kansas State Univ., Manhattan, KS 66506). **Interaction of organophosphorus compounds with phenothiazine tranquilizers in sheep.** *Tr. Kansas Acad. Sci.* 78(1-2): 22; 1976.

The interaction of organophosphorus compounds and phenothiazine derivatives was studied by administering Coumaphos (C) and Triflupromazine HCl (TFP) to 8 groups of 5 sheep each fed normal or low protein diets. C was administered orally at 8 mg or 15 mg/kg body weight TFP or saline. Onset of clinical signs, mortality rate, mean survival time, necropsy lesions, and plasma and erythrocyte cholinesterase (ChE) activity was monitored for each group. Observations suggested potentiation and synergetic effect between the administered compounds. Inhibition of ChE activity was enhanced in groups receiving both drugs. Low dietary protein levels adversely affected the development of clinical signs, the mortality rate, the mean survival time, and ChE activity. Recovery of ChE activity of TFP-treated animals was faster than in their respective controls, and animals on normal protein diet had faster ChE recovery than those fed the low protein diet.

77-0912. Abdullaev, U. A.; Uzakov, U. Ia.; Shim, R. N. (Author address not given). **Vliianie mnogokratnykh pro-**

tivokleshchevykh obrabotok na aminokislotyni sostav syvorotki krovi. [**Effect of multiple antitick treatments on serum amino acid composition.**] *Tr. Uzb. Nauchno-Issled. Inst. Vet.* 21: 5-6; 1973. (Russian)

The effect of multiple cutaneous treatment with 0.25-0.75% emulsions of dibrom (naled) and with 0.5% emulsion of ciodrin (crotoxyphos) on the serum amino acid spectrum was studied in calves 6-96 hr after the first to 25th treatments, repeated at weekly intervals. Investigations performed 48 hr after the fifth treatment with 0.75% dibrom revealed increased lysine, histidine and aspartic acid levels. Increased histidine, aspartic acid, glycine and alanine levels, and reduced lysine, serine, tyrosine, valine and leucine levels were found in calves treated with ciodrin. The increased histidine level is possibly due to the toxicity of the preparations.

77-0913. Kuul', A. K. (All-Union Inst. Exp. Vet. Med., USSR). **Lechenie pri ostrom otravlenii zhivotnykh ftalofosom.** [**Treating animals for acute phthalophos poisoning.**] *Veterinariya (Moscow)* (5): 98-99; 1976. (Russian)

The efficacy of antidote therapy was studied in Chinchilla rabbits and in hens poisoned with LD100 doses of phthalophos (160 mg/kg for rabbits, 600 mg/kg for hens), administered orally in aqueous suspension. The antidotes were administered i.m. immediately after the manifestation of the poisoning symptoms. The rabbits received tropacine and atropine (5 mg/kg each), dipyroxime (10 mg/kg), and isonitrosine (20 mg/kg, 1-5 times during the first day, then once daily). All untreated rabbits died in 20-60 min. The antidote therapy had 100% efficiency, the therapeutic effect manifested itself in 5-10 min. The hens received one to two doses of atropine (5 mg/kg), tropacine and dipyroxime (10 mg/kg each), and isonitrosine (20 mg/kg). The antidote therapy was ineffective in all hens; the untreated animals died 1-3 hr after poisoning, the treated ones 2-3 hr later.

77-0914. Bookhout, C. G.; Costlow, J. D., Jr.; Monroe, R. (Dep. Zool., Duke Univ., Durham, NC 27706). **Effects of methoxychlor on larval development of mud-crab and blue crab.** *Water Air Soil Pollut.* 5(3): 349-365; 1976. (20 references)

Laboratory experiments were conducted to determine the effect of methoxychlor on the larval development of the mud-crab, *Rhithropanopeus harrisii*, and the commercial blue crab, *Callinectes sapidus*, from the time of hatching until the first crab stage was reached. The effect of a range of concentrations of methoxychlor on survival of larvae of *C. sapidus* and *R. harrisii* was determined, as well as the concentrations which were sublethal and lethal. Concentrations as low as 1.3, 1.6 and 1.9 ppb (μgl^{-1}) methoxychlor were acutely toxic to *C. sapidus* larvae, and it took a concentration as high as 7.0 ppb to be acutely toxic to *R. harrisii* larvae. Zoeal and total development to the 1st crab state of *R. harrisii* and *C. sapidus* were prolonged in relation to increased concentrations of methoxychlor. The developmental stages in which larvae were particularly sensitive varied in the two species. Methoxychlor residues of *R. harrisii* and *C. sapidus* larvae reared in concentrations of methoxychlor were determined.

77-0915. Solbe, J. F. de L. G.; Copper, V. A. (Water Res. Ctr., Stevenage Lab., Herts., England). **Studies on the toxicity of copper sulphate to stone loach *Noemacheilus barbatulus* (L.) in hard water.** *Water Res.* 10(6): 523-527; 1976. (14 references)

The toxicity of copper sulphate to *Noemacheilus barbatulus* was studied for 64 days in a water of total hardness 249 mg/l as $CaCO_3$. The 63-day LC_{50} was approximately 0.25 mg Cu/l. Larger fish survived longer and at concentrations greater than 0.29 mg/l fish hid less during daylight. *Noemacheilus* surviving 0.12 mg/Cu for 64 days shed copper when placed in clean water for 7 days: gill, muscle, eye and vertebrae lost significant amounts of copper during this period. The opportunity to shed copper during a short period when the poison supply to their tank failed may have allowed fish exposed to 0.49 mg/l to live 12 days longer than expected. The sensitivity of *Noemacheilus* to copper, cadmium and zinc was compared with that of rainbow trout, *Salmo gairdneri*.

77-0916. Powers, C. D.; Rowland, R. G.; Wurster, C. F. (Mar. Sci. Res. Ctr., State Univ. New York, Stony Brook, NY 11794). **Dialysis membrane chambers as a device for evaluating impacts of pollutants on plankton under natural conditions.** *Water Res.* 10(11): 991-994; 1976. (20 references)

Growth rates of a marine dinoflagellate, treated with DDE, at 1, 5 or 10 parts per thousand million (10^9; ptm) and cultured in dialysis membrane bags suspensed in the tidal channel of an estuarine marsh, were compared with growth rates of untreated organisms cultured under the same conditions or as laboratory (batch) cultures in natural water or nutrient-enriched artificial seawater. DDE-treated cells were inhibited (relative to controls) for 2-4 days, consistent with previous laboratory tests which revealed the high sensitivity of this organism to low concentrations of DDE. Untreated cells in dialysis bags in the estuary grew at a faster rate after the first few hours than either type of batch culture, and yielded a higher final cell density than laboratory cultures utilizing the same natural water.

77-0917. El-Dib, M. A.; Aly, O. A. (Water Pollut. Contr., Natl. Res. Ctr., Dokki, Cairo, Egypt). **Persistence of some phenylamide pesticides in the aquatic environment. III. Biological degradation.** *Water Res.* 10(12): 1055-1059; 1976. (11 references)

Mixed populations of microorganisms of river water and sewage did not metabolize IPC (propham), CIPC (chlorpropham), linuron, monuron, stam (propanil)

and vitavax (carboxin) during test periods lasting for 4 months. *Bacillus cereus*, when added to the aqueous solutions of these pesticides, was able to degrade IPC, linuron, stam and vitavax whereas CIPC and monuron were chemically stable. The investigated phenylamides have no inhibitory effects on bacteria and are not expected to affect the process of self-purification of surface waters. Susceptibility of phenylamides to biodegradation in aquatic environment and their health hazards were discussed.

77-0918. Canton, J. H.; van Esch, G. J.; Greve, P. A.; Van Hellemond, A. B. A. M. (Lab. Toxicol., Natl. Inst. Publ. Health, Bilthoven, The Netherlands). **Accumulation and elimination of γ-hexachlorocyclohexane (γ-HCH) by the marine algae *Chlamydomonas* and *Dunaliella*.** *Water Res.* 11(1): 111-115; 1977. (3 references)

Chlamydomonas rapidly accumulates α-HCH (α-BHC) (α-hexachlorocyclohexane) from aqueous solutions; elimination also takes place rapidly, i.e. in less than 30 min. The average concentration factor f, defined as the α-HCH concentration in the algae (μg/g) divided by the α-HCH concentration in the water phase (μg/ml) amounts to 0.31×10^3 (range: 0.21×10^3 to 0.41×10^3, depending on the batch of the algae). The concentration factor is not dependent on the α-HCH or cell concentration. This is in agreement with the fact that α-HCH was not found to be acutely toxic to *Chlamydomonas* in concentrations up to the solubility limit. The accumulated α-HCH is found primarily in the cell content, corresponding with the low fat content of the cell wall: the non-lipid fraction accumulates 11-14% of the total amount of α-HCH only. Accumulation of α-HCH proved to be correlated with the lipid content of the cell, as illustrated by accumulation experiments with algae with different fat content. The concentration factor on lipid basis was 12,000-13,000. No difference was found in accumulation behavior between living or dead algae cells.

77-0919. Crawford, M. J.; Hutson, D. H.; King, M. A. (Shell Res. Ltd., Tunstall Lab., Sittingbourne Res. Ctr., Sittingbourne, Kent, England). **Metabolic demethylation of the insecticide dimethylvinphos in rats, in dogs, and in vitro.** *Xenobiotica* 6(12): 745-762; 1976. (21 references)

The alkenyl phosphate insecticide, dimethylvinphos, is rapidly metabolized and eliminated by rats and dogs. Metabolism proceeds via demethylation followed by the hydrolysis of desmethyl dimethylvinphos to 2,4-dichlorophenacyl chloride which is further metabolized mainly to 2,4-dichloromandelic acid, 1-(2,4-dichlorophenyl) ethanol (glucuronide) and 2,4-dichlorophenylethenediol (glucuronide). The dechlorination of 2,4-dichlorophenacyl chloride to 2,4-dichloroacetophenone proceeds via the spontaneous formation of *S*-(2,4-dichlorophenoacyl) glutathione which is converted to the ketone by an enzyme-catalyzed glutathione-dependent reaction. Demethylation of dimethylvinphos occurs in liver fractions via the action of two enzymes: glutathione *S*-methyl transferase in the cytosol, and microsomal mono-oxygenase. The relatively high activities of both enzymes in dog liver (compared with rat liver) partly account for the observed differences in metabolism and toxicity of dimethylvinphos in the two species. The glutathione transferase is enhanced twofold by pre-treatment of rats with 0.1% phenobarbital in their drinking water. This treatment also induces the microsomal demethylation 45-fold and results in a > 13-fold protective effect against the acute toxic effects of dimethylvinphos. (Author abstract by permission)

77-0920. Berko, G.; Szilagyi, I. (Clinica Dermato-Venerologica, Szeged, Koranyi Fasor 8-10, Hungary). **Verfugt das Hexachlor-Cyclohexan-haltige Scabicid, das Jacutin, uber porphyrinogene Eigenschaften? [Does the BHC-containing scabicide jacutin have porphyrinogenic properties?]** *Z. Hautkr.* 50(24): 999-1002; 1975. (18 references) (German)

Earlier observations of hepatotoxic changes and chronic porphyria in rats after oral application of BHC prompted experiments on adult male rats and clinical trials concerning the effect of Jacutin, a scabicide containing 0.3% BHC, on the liver and on porphyrin metabolism. The preparation was applied on the skin. Ten rats were treated daily for 6 weeks; uroporphyrin analyses were performed before the treatment and weekly during the treatment. Thirty adult patients underwent Jacutin treatment for 3 days; serum leucine aminopeptidase (LAP), uroporphyrin, δ-aminolevulinic acid, and porphobilinogen tests were performed before the treatment and 3 and 12 days after the initiation of the application. The total amount of BHC applied on the skin of one patient was about 210 mg. The treatment caused no noteworthy changes in the biochemical parameters investigated, which indicates that under the specific experimental conditions the BHC present in the preparation caused no hepatotoxic effect, nor any disturbances in porphyrin metabolism.

see also **77-0756 77-0762 76-0770 77-0780 77-0804 77-0963 77-0965**

77-0921. Sobotka-Wierzbowica, J. (Dep. Med. Pharm., Inst. Med., Warsaw). **Badania pozostalosci pestycydow chloroorganiznych w niektorych roslinnych surowcach lecznicych. [Determination of organochlorine pesticide residues in some medicinal plant raw materials.]** *Acta Pol. Pharm.* 33(1): 93-99; 1976. (32 references) (Polish)

Considering criticism of methods of the determination of chloroorganic pesticides in food products, a modification has been elaborated for assaying these contaminants in herbal raw materials. The method involves fourfold extraction of the raw material with a mixture of hexane and ethyl ether (97 : 3), purification of the extract by its application on a florisil column, and subsequent elution with a mixture of hexane and ethyl ether (99 : 1). From the hexane eluate, pesticides are transferred into acetonitrile. The acetonitrile extract is subsequently concentrated by azeotropic distillation with hexane. Next, the chloroorganic pesticides are separated by thin-layer chromatography with heptane on aluminum oxide, and estimated by planimetry of the spots. Among 13 raw materials, only thyme and flaxsud were found to be free of chloroorganic pesticides, whereas in other raw materials, their levels ranged from 0.32 ppm to 26.1 ppm.

77-0922. Groszkowski, S.; Kurzawinska, J. (Dep. Chem. Pharm. Anal. Med., Lodz, Poland). **Bezposrednie oznaczanie szesciochlorocykloheksanu etanolem sodowym, w srodowisku niewodnym. [Determination of BHC by direct titration with sodium ethoxide in anhydrous medium.]** *Acta Pol. Pharm.* 33(3): 359-363; 1976. (4 references) (Polish)

A simple method of the determination of hexachlorocyclohexane by direct titration of chlorine with sodium ethoxide in the dimethylformamide medium either in the presence of a indicator or potentiometrically, in a mixture of anhydrous ethanol and dimethylformamide (1 : 1), has been developed.

77-0923. Jensen, S.; Renberg, R.; Reutergardh, L. (Natl. Swed. Environ. Protect. Board, Wallenberg Lab., Stockholm, Sweden). **Residue analysis of sediment and sewage sludge for organochlorines in the presence of elemental sulfur.** *Anal. Chem.* 49(2): 316-318; 1977. (11 references)

Organochlorines, including PCB and DDT, in sediment and sludge are determined in the presence of elemental sulfur. The method can also be used for unprejudiced search for both volatile and/or polar pollutants. The sulfur interfering in the gas chromatographic determination is removed in a nondestructive treatment of the extract with tetrabutylammonium sulfite. This lipophilic ion pair rapidly converts the sulfur to thiosulfate in an organic phase. The recovery of added organochlorines was above 80% and the detection limit in the range of 1-10 ppb from a 10-g sample.

77-0924. Dolan, J. W.; Seiber, J. N. (Dep. Environ. Toxicol., Univ. California, Davis, CA). **Chlorine-selective detection for liquid chromatography with a Coulson electrolytic conductivity detector.** *Anal. Chem.* 49(2): 326-330; 1977. (20 references)

The design and operation of a liquid chromatography/Coulson electrolytic conductivity detector (CECD) analytical system are described. Vydac totally porous reversed phase column effluent (aqueous methanol) was introduced to the CECD quartz combustion tube through a stainless steel inlet. The conductivity response of pyrolysis products formed in the presence of hydrogen was monitored with slight modifications of the standard CECD cell operation. The system showed high selectivity to organochlorine compounds relative to hydrocarbons, with a linear range of 10^5 and minimum detectability of 5-50 ng for lindane. The CECD detectability was better than that of the UV_{254} detector and its selectivity greater than that of the UV_{220} detector, when Cl-containing aliphatic pesticides were examined. This was reflected in the successful CECD analysis of uncleaned extracts of lettuce and river water fortified to sub-ppm levels with aldrin and dieldrin and the corresponding failure of the UV detector at either 254 or 220 nm in the same analyses. (Author abstract by permission)

77-0925. Wu, C.; Suffet, I. H. (Environ. Stud. Inst., Dep. Chem., Drexel Univ., Philadelphia, PA 19104). **Design and optimization of a teflon helix continuous liquid-liquid extraction apparatus and its application for the analysis of organophosphate pesticides in water.** *Anal. Chem.* 49(2): 231-237; 1977. (11 references)

A statistical optimization study leading to the final design and operational parameters for extraction of organophosphate pesticides is described with a new "Teflon Helix Continuous Liquid-Liquid Extractor". A coil length of 32 feet, helix winding diameter of 1 inch, aqueous flow rate of 900 ml/h, water to solvent ratio of 10:1 without premixing were the optimal design parameters. Recoveries of μg to ηg/l. concentrations of organophosphate pesticides from fortified river water, sea water, and secondary sewage effluent were completed. Greater than 80% efficiency relative to batch extraction is demonstrated with continuous liquid-liquid extraction and continuous evaporative concentration.

77-0926. Donkin, P.; Mann, S. V.; Hamilton, E. I. (Inst. Mar. Environ. Res., Plymouth, England). **Microcoulometric determination of total organochlorine pesticide and polychlorinated biphenyl residues in grey seal (*Halichoerus grypus*) blubber.** *Anal. Chim. Acta* 88(2): 289-301; 1977. (21 references)

A procedure for estimating total organochlorine pesticide and PCB residue in seal blubber at concentrations of greater than 1 μg/g of lipid is described. Lipid is cleaned up by alumina column chromatography, and the halogen concentration of the resulting hexane eluate is

determined by combustion and microcoulometry. Results are similar to those obtained by gas chromatographic analysis and can be used to interpolate between results so obtained when data on specific organochlorine compounds is not required for each sample. The organochlorine residues recovered in this manner did not constitute all the halogen determined by combustion and microcoulometry of seal lipid. Analysis by the total halogen procedure was 2.5 times faster than the rate achieved with a combination of liquid and gas chromatography operated manually; the requirements for laboratory equipment and space for sample preparation are reduced. (Author abstract by permission)

77-0927. Bromilow, R. H. (Chem. Liaison Unit, Rothamsted Exp. Stn., Harpenden, Hertfordshire, England). **Determination of residues of oxamyl in crops and soils by gas-liquid chromatography.** *Analyst (London)* 101(1209): 982-985; 1976. (4 references)

A method is described for the determination of oxamyl residues in crops and soils by gas-liquid chromatography. Oxamyl is extracted with dichloromethane or acetone-dichloromethane and is separated from interfering co-extractives by chromatography on a Florisil column. It is then determined by gas-liquid chromatography using on-column reaction with trimethylphenylammonium hydroxide, the derivative so formed being determined by a flame-photometric detector operated in the sulfur mode. Approximately 0.5 μg of oxamyl can be detected in a 50-g sample. (Author abstract by permission)

77-0928. Wardall, G. L. (Minist. Agric., Fisheries Food, Pest Infestation Control Lab., Tolworth, Surbiton, Surrey, England). **Method for the extraction of organochlorine compounds from quail eggs.** *Analyst (London)* 102(1210): 54-55; 1977. (3 references)

A need arose for a rapid method for extraction of organochlorine compounds from the eggs of Japanese quail (*Coturnix coturnix japonica*) that had been fed experimentally with various organochlorine pesticides. Published methods did not meet criteria for rapidly, reproducibility or purity of the final extract, and an alternative method was therefore sought. The proposed method combines clean-up and extraction procedures, thus saving time, and produces an extract that is clean enough for electron-capture gas-liquid chromatography without affecting the long-term sensitivity of the apparatus. (Author abstract by permission)

77-0929. Miles, J. W.; Dale, W. E.; Churchill, F. C. (Vector Biol. Control Div., Bur. Trop. Dis., Cent. Dis. Control, Public Health Serv., U.S. Dep. Health, Educ., Welfare, Atlanta, GA). **Storage and analysis of samples of water, fish and mud from environments contaminated with abate.** *Arch. Environ. Contam. Toxicol.* 5(1): 29-41; 1976. (13 references)

Methods for extraction, cleanup, and analysis of samples of water, mud, and fish containing trace quantities of Abate (temephos) have been developed. Water was extracted by high-speed stirring of 10 ml of hexane in a 300-ml sample. The extracts were evaporated and analyzed by gas chromatography with a limit of detection of 0.00003 ppm. Dried mud samples were extracted by shaking with acetone. An aliquot of the acetone extract was diluted with water and the Abate extracted into 10 ml of hexane by high-speed stirring. The extracts were analyzed by gas chromatography. Fish were extracted with methylene chloride, cleaned up on a silica gel column, and analyzed by gas chromatography. The limit of sensitivity of the methods for mud and fish was found to be 0.001 ppm. Fish samples were stored for 3 weeks in 10% formalin containing 5% sodium thiosulfate without significant loss of Abate residues. A biological magnification of greater than 100 was observed in fish exposed to Abate for 16 hr at concentrations of 0.02 and 0.002 ppm. (Author abstract by permission)

77-0930. Alford, A. (U.S. Environ. Protect. Ag., Environ. Res. Lab., Athens, GA 30601). **Environmental applications of mass spectromety.** *Biomed. Mass Spectrom.* 4(1): 1-22; 1977. (272 references)

The 1975 publications reporting organic and spark source mass spectrometric studies on environmental samples were compiled. Emphasis was placed on pollutants identified rather than methods and techniques used, and reports that did not incorporate data obtained by a technique's application were not included. The 272 reports cited vary from those reporting hundreds of identified pollutants to those describing the analysis of only one sample contamining one or a few pollutants. The following sample types were not considered to be environmental samples: forensic samples, synthetic or 'standard' samples, and samples analyzed for drug residues.

77-0931. Maini, P.; Deseo, K. V. (Pesticide Residue Lab. - Dentro Experienze Ricerche, SIAPA SpA, 40015 GALLIERA (BO), Italy). **Thin layer chromatographic detection of diflubenzuron in biological samples.** *Bull. Environ. Contam. Toxicol.* 16(6): 702-208; 1976. (18 references)

Samples of excrement from *Zeuzera pyrina* larvae were collected from an apple orchard in Galliera, Italy. Some of the trees in the orchard had been treated with diflubenzuron. Samples of bark and living wood from the trees were also collected. The samples were examined by thin-layer chromatography. The bark and excrement from both treated and untreated trees contained captan, the entire orchard having been previously treated with a captan-based fungicide. Diflubenzuron was present in the bark and excrement from all treated trees, but the wood samples contained none of the pesticide. While the data indicated that the *Z. pyrina* larvae had ingested difluben-

zuron from the bark of the treated trees, the amounts ingested did not reach toxic levels, as no significant difference was observed between the number of deformed or dead larvae and pupae in treated trees.

77-0932. Woidich, H.; Pfannhauser, W.; Blaicher, G. (Forschungsinst. Ernahrungswirtsch., Vienna, Austria). **Quantitative Direktauswertung zinnorganischer Verbindungen ueber Anfarbung mit Brenzkatechinviolett. [Quantitative direct determination of organotin compound by coloration with pyrocatechol violet.]** *Dtsch. Lebensm.-Rundsch.* 72(12): 421-422; 1976. (6 references) (German)

A direct method for the quantitative thin-layer chromatographic determination of organotin compounds in foodstuffs and other media is described. After development on Silica gel G with a solvent system consisting of methylisobutylketone, pyridine and acetic acid (97.5:1.5:1 vol. %) in a saturated chamber, the plate is dired at 120 C, saturated with bromine vapor, and sprayed with 0.1% alcoholic solution of pyrocatechol violet. After the plate was dried, the spectrophotometric measurement was carried out at 580 nm. For quantitative determination, it is necessary to measure standard concentrations on the same plate. The limit of detectability, determined for different organotin compounds, ranges from 0.10 to 0.42 μg.

77-0933. Lukens, H. R.; Williams, C. B. (IRT Corp., Convoy Court, San Diego, CA). **Fluorescence immunoassay technique for detecting organic environmental pollutants.** *Environ. Sci. Technol.* 11(3): 292-297; 1977. (11 references)

The development of an immunological assay for 2-aminobenzimidazole, the degradation product of several carbamate pesticides such as benomyl, is described. The specific technique is a fluorescence polarization immunoassay, and it may be applicable to the detection of many low-molecular-weight organic contaminants of organic concern. The preparation of the two required reagents, namely a fluorescent conjugate of the contaminant of interest, together with an antibody to the contaminant, is described in detail. The specific contaminant chosen for this study was 2-aminobenzimidazole (MW = 133), a metabolite of certain fungicide agents used in agriculture, and the particular fluorescent moiety chosen to form the conjugate with 2-aminobenzimidazole was fluorescein. A successful demonstration of the assay is accomplished, and a detection sensitivity in the subnanogram/ml range obtained. (Author abstract by permission)

77-0934. Guseva, A. I. (Author address not given). **Usovershenstvovanie metodiki i apparatury dlia analiza serosoderzhashchick organicheskikh soedinenni v vozdukhe. [Improvement of method and apparatus for analysis of organosulfur compounds in air.]** *Gig. Sanit.* (6): 56-57; 1976. (6 references) (Russian)

Improved method and apparatus for the determination of organosulfur compounds in air are described. The organosulfur compounds are absorbed in alcohol, which is then incinerated over Ni-Cr wire. At an air flow rate of 1 liter/min, the incineration of a 5-ml specimen takes 30 min. Hydrogen peroxide solution is used to convert the sulfur dioxide to sulfate ions, which latter are determined nephelometrically. The sensitivity of the method amounts of 0.012 mg/5 ml.

77-0935. Gevorkian, S. G.; Petrosian, M. S.; Vasilenko, A. E.; Stepanian, G. S. (Armen. Br. All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic., Polym. Plastic Mater., Erevan, USSR). **Opredelenie karagarda v vode, pochve i rastitel'nom materiale metodom khromatografii v tonkom sloe sorbenta. [TLC determination of Karagard in water, soil, and plants.]** *Gig. Sanit.* (12): 78-80; 1976. (Russian)

Thin-layer chromatographic method for the detection and quantitative determination of Karagard (a new herbicide containing 25% terbuthylazine and 25% terbumeton) in water, soil and plants is described. After extraction (with chloroform from water, with acetone from soil, and with *n*-hexane from plants) and clean-up, determination is done in a chromatographic chamber with a 10:3 ratio of *n*-hexane and acetone. Bromophenol blue in acetone and aqueous solution of silver nitrate are used for visualization. The two components of karagard appear on the chromatogram in the form of dark blue spots. The *RF* values are 0.23±0.05 for GS-13529, and 0.59±0.05 for GS-14259. Quantitative determination is done by visual comparison of the spot surface areas and of the color intensity with standard solutions. The sensitivity of the method amounts to 1 μg in the sample.

77-0936. McBlain, W. A.; Currie, R. W.; Wolfe, F. H. (Dep. Food Sci., Univ. Alberta, Edmonton, Alberta, Canada). **Facile route to the resolution of the enantiomers of 1-chloro-2- [2,2,2,-trichloro -1- (4-chlorophenyl)ethyl] benzene (*o,p'*-DDT).** *J. Agric. Food Chem.* 25(1): 59-63; 1977. (14 references)

The estogenic component of technical grade DDT, (±)-*o,p'*-DDT, has been resolved into its enantiomeric forms. Aromatic mononitration was followed by reduction to the amine and converstion to the (+)-camphor-10-sulfonate salts. While fractional crystallization of the diastereomeric salts from acetonitrile led to optical purification of the (-)-amine salt, a reflux technique provided a more expedient route to the isolation of not only the (-)-amine salt but the (+)-amine salt as well. Deamination of the resolved amines by diazonium salt formation yielded *o,p'*-DDT with specific rotations of -17.9 and 17.7 C. This route may be useful for the resolution of medically important (±)-*o,p'*-DDD. (Author abstract by permission)A

77-0937. Saleh, M. A.; Casida, J. E. (Pestic. Chem. Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA). **Consistency of toxaphene composition analyzed**

by open tubular column gas-liquid chromatography. *J. Agric. Food Chem. 25(1): 63-68; 1977. (12 references)*

Each of 8 toxaphene samples manufactured by Hercules from 1949 to 1975 shows the same 29 major peaks in almost identical ratios based on analyses by open tubular column gas-liquid chromatography (GLC) with a linear electron capture detector. About 85% of the total peak area is accounted for by these 29 peaks which individually vary from 1 to 8% of the total. The 8 toxaphene samples from Hercules are easily differentiated by open tubular column GLC from 12 samples of related chlorinated terpenes from other manufacturers in the United States and abroad and from [^{14}C]- and [^{36}Cl]toxaphene prepared by Hercules. A more detailed analysis of toxaphene composition is provided by open tubular column GLC of toxaphene components in each of five TLC regions which are precisely defined by the use of selected fluorene marker dyes. Despite large composition differences between some of the samples, there is surprisingly little variation in their mouse intraperitoneal and housefly topical LD_{50} values. (Author abstract by permission)

77-0938. Parlar, H.; Nitz, S. G.; Korte, F. (Inst. Oekol. Chem. Ges. Strahlen Umweltforsch., Munich, Germany). **A contribution to the structure of the toxaphene components. Spectroscopic studies on chlorinated bornane derivatives.** *J. Agric. Food. Chem.* 25(1): 69-72; 1977. (12 references)

The ir, MS, ^{1}H NMR, and ^{13}C NMR spectroscopic behavior of the synthetically produced low chlorinated bornane derivatives was studied. The obtained data were used for the spectral analysis of compound I, a substance isolated from technical toxaphene. It was further attempted to characterize the composition of technical toxaphene on the basis of spectroscopic data from defined toxaphene fractions. (Author abstract by permission)

77-0939. King, R. R. (Res. Stn., Res. Branch, Agric. Canada, Fredericton, New Brunswick, Canada). **Derivatization of ethylenethiourea with *m*-trifluoromethylbenzyl chloride for analysis by electron-capture gas chromatography.** *J. Agric. Food Chem.* 25(1): 73-75; 1977. (18 references)

m-Trifluoromethylbenzyl chloride reacts with ethylenethiourea in the same manner as benzyl chloride. The resultant *S*-(*m*-trifluoromethylbenzyl) derivative is stable, has good GLC characteristics, and can readily be detected at 0.01 ppm by electron-capture detector. The *N*-trifluoroacetylated analogue was detectable by flame photometric detector (S mode) and electron-capture detector at levels of 0.01 and 0.002 ppm, respectively. Recoveries of ethylenethiourea from apples, green beans, potatoes, and tomatoes at fortification levels of 0.01 to 1.0 ppm averaged 92.5 ± 4.6%. (Author abstract by permission)

77-0940. Lores, E. M.; Bradway, D. E. (Anal. Chem. Branch. Environ. Toxicol. Div., Health Eff. Res. Lab., Research Triangle Park, NC). **Extraction and recovery of organophosphorus metabolites from urine using an anion exchange resin.** *J. Agric. Food Chem.* 25(1): 75-79; 1977. (4 references)

Urinary metabolites of organophosphorus pesticides are extracted quantitatively from urine by using an ion exchange resin. The metabolites were subsequently derivatized on the resin for FP-GC analysis. Several ion exchange resins and a variety of methods for the recovery of the metabolites from the resin were investigated. When used in coordination with a previously developed method, higher recoveries and decreased gas chromatographic interferences were obtained. Recovery data, limits of detectability, and analysis of urine samples from individuals exposed to organophosphorus pesticides are reported. (Author abstract by permission)

77-0941. Newhall, W. F.; Buslig, B. F. (Inst. Food Agric. Sci., Agric. Res. Educ. Cent. Univ. Florida, Lake Alfred, FL). **An analytical procedure for determining residues of the quaternary ammonium plant regulator AMCHEM Z-2088.** *J. Agric. Food Chem.* 25(1): 198-200; 1977. (9 references)

To elucidate the relatively short-term (14 day) growth retardant effects of the plant regulator dimethylheptyl- (1-hydroxy-*p*-menth-2-yl) ammonium bromide (AMCHEM Z-2088) on grapefruit trees (*Citrus paradisi* MacF.), an analytical procedure has been developed to determine its biological half-life in the leaves. Isolation and purification were accomplished by column and paper chromatography. Regulator levels were measured colorimetrically as the dipicrylamine complex at 415 nm. At a treatment level of 30 g per tree, the biological half-life for this plant regulator in grapefruit levels was 10.8 days. (Author abstract by permission)

77-0942. Lawrence, J. F. (Food Res. Div., Bur. Chem. Safety, Health Prot. Branch, Tunney's Pasture, Ottawa, Ontario, Canada). **Direct analysis of some carbamate pesticides in foods by high-pressure liquid chromatography.** *J. Agric. Food Chem.* 25(1): 211-212; 1977. (11 references)

The application of high-pressure liquid chromatography (HPLC) to the screening of several carbamate pesticides in selected foods was investigated. The pesticides were extracted from crops (cabbage, corn, potato, and wheat) with acetone, and then partitioned into hexane-methylene chloride. The organic extract was reduced to a small volume and passed through a 2% deactivated Florisil column. The fraction containing the pesticides was evaporated to dryness and dissolved in isooctane for analysis by HPLC on a 25 cm x 2.8 mm i.d. column of LiChrosorb Si 60 (5 μm) with UV detection at 254 nm. Detection limits of 0.004-0.05 ppm were obtained for carbamates such as swep, carbaryl, zectran (mexacarbate), matacil (amiocarb), and mobam while others such as landrin, car-

bofuran, and banol (carbanolate) could be detected at 0.1-0.3 ppm. (Author abstract by permission)

77-0943. Zehner, J. A.; Simonaitis, R. A. (Stored-Prod. Insects Res. Dev. Lab., Agric. Res. Serv., U.S. Dep. Agric., Savannah, GA). **Determination of pirimiphos methyl in formulations by high performance liquid chromatography.** *J. Assoc. Off. Anal. Chem.* 60(1): 14-15; 1977. (5 references)

A simple and rapid method for the determination of pirimiphos methyl (*O*-[2-(diethylamino)- 6-methyl-4-pyrimidinyl] *O,O*-dimethylphosphorothioate) in formulations by high performance liquid chromatography is described. The sample is dissolved in methanol, and biphenyl is added as an internal standard. Then the sample is chromatographed by reverse phase chromatography on a Zipax octadecylsilane column. A 4 μl injection containing 0.01% pirimiphos methyl produces a 50% full scale peak at the maximum absorbance at 254 nm. (Author abstract by permission)

77-0944. Worobey, B. L.; Webster, G. R. . (Pestic. Res. Lab., Dep. Soil Sci., Univ. Manitoba, Winnipeg, Manitoba, Canada). **Gas-liquid chromatographic determination of diflubenzuron (dimilin) in water as its trifluoroacetyl derivative.** *J. Assoc. Off. Anal. Chem.* 60(1): 213-217; 1977. (11 references)

A new gas-liquid chromatographic (GLC) procedure has been developed for the analysis of diflubenzuron, 1-(4-chlorophenyl)-3- (2,6-difluorobenzoyl) urea, in pond water. The residues from fortified pond water were extracted with ethyl acetate, derivatized, and cleaned up on a mini Florisil column. The diflubenzuron was determined by GLC as its *N,N'*-di(trifluoroacetyl) derivative, using electron capture detection. A 50% full scale deflection was obtained with 0.03 ng injected. Recoveries from fortified unfiltered pond water were 65.7, 72.8 82.0, and 90.8% at the 0.020, 0.059, 0.197, and 0.788 mg/L (ppm) levels, respectively. Recoveries from fortified filtered pond water were 94.1 and 89.3% at the 0.020 and 0.060 mg/L levels, respectively. It is postulated that diflubenzuron is immobilized by adsorption, for example, to particulate organic matter in the pond water because recovery data from unfiltered water followed the linear form of the Freundlich equation. (Author abstract by permission)

77-0945. Ott, D. E.; Friestad, H. O. (Agric. Univ. Norway, Chem. Res. Lab., Norway). **Automated analytical system for phenols incorporated into screening method suitable for determination of 2-methyl-4- chlorophenoxyacetic acid and/or 2,4-dichlorophenoxyacetic acid herbicide residues in water.** *J. Assoc. Off. Anal. Chem.* 60(1): 218-223; 1977. (11 references)

2-Methyl-4- chlorophenoxyacetic acid (MCPA) and 2,4-dichlorphenoxyacetic acid (2,4-D) are extracted from water with methylene chloride and are degraded when heated in the presence of pyridine hydrochloride to their corresponding phenols which are determined automatically with a modified distillation-colorimetric analyzer system. The method has been evaluated primarily with surface water samples collected from areas of known MCPA applications. The lower limit of detection of MCPA is about 50 μg/L water. Response for 2,4-D is almost identical to that for MCPA at equal concentrations. Comparative responses to other potential responding phenoxy acid herbicides have not been determined. MCPA results from this method for several water samples compared favorably with results from a gas chromatographic method. The semiautomated colorimetric method can be applied to water samples of unknown history as a screening method in which case a significant, positive recorder response, suitably corrected for free phenol response as suggested herein, indicates probability of presence of one or more of the responding herbicides. The sample would then need to be examined by other, more definitive means. (Author abstract by permission)

77-0946. Coburn, J. A.; Valdmanis, I. A.; Chau, A. S. Y. (Water Qual. Branch, Canada Cent. Inland Waters, Burlington, Ontario, Canada). **Evaluation of XAD-2 for multiresidue extraction of organochlorine pesticides and polychlorinated biphenyls from natural waters.** *J. Assoc. Off. Anal. Chem.* 60(1): 224-228; 1977. (13 references)

The Amberlite polymeric resin, XAD-2, was evaluated for multiresidue extraction of ng/L levels of several organochlorine pesticides and polychlorinated biphenyls (PCBs) from fortified distilled water and from fortified and unfortified natural waters. Recoveries from 1 l distilled water samples fortified with 10-100 ng of 100 organochlorine pesticides averaged 96%. Recoveries averaged 85% for XAD-2 resin extraction of fortified natural samples collected from across Canada. Unfortified control samples contained no detectable levels of any of the pesticides used in the fortification. The resin is not suitable for extracting Mirex from natural water; only about 50% of added mirex was recovered. Recoveries of PCBs from 2 l natural water samples, fortified with 250 ng PCBs/l and corrected for losses on the silica gel fractionation column and apparent PCB content of the control samples, ranged from 78 to 86%. Blanks for the resin extraction procedure were very low, averaging 4 ng PCBs/l. (Author abstract by permission)

77-0947. Bong, R. L. (Food Drug Admin., Minneapolis, MN). **Collaborative study of the recovery of hexachlorobenzene and mirex in butterfat and fish.** *J. Assoc. Off. Anal. Chem.* 60(1): 229-232; 1977. (4 references)

A previously published method applicable to the recovery of hexachlorobenzene (HCB) and Mirex (dechlorane) from fats and oils has been collaboratively studied by 8 laboratories. The method involves distribution of the fat or oil on unactivated Florisil and elution of the HCB and Mirex with acetonitrile. The 2 compounds

are then partitioned into petroleum ether and eluted through activated Florisil with methylene chloride-hexane. Electron capture gas-liquid chromatography is utilized as the determinative step. In the collaborative study, samples of sablefish and butterfat were fortified at 2 different levels; each level was determined in duplicate. Average HCB recoveries of 98±% and 95±13% at respective levels of 0.06 and 0.5 ppm were obtained from the fish sample. Mirex recoveries in the fish sample at the same levels were 85±14% and 96±10%. The butterfat sample was fortified at a low level of 0.13 ppm for both compounds and at high levels of 0.62 and 0.66 ppm for HCB and Mirex, respectively. The low level HCB recovery was 104±6% and the high level was 99±10%. In the same order, Mirex was recovered at 104±7% and 103±6%. The method has been adopted as official first action for the determination of HCB and Mirex in fish and fatty dairy products. (Author abstract by permission)

77-0948. Rourke, D. R.; Mueller, W. F.; Yang, R. S. H. (Inst. Comp. Hum. Toxicol., Albany Med. Coll., Albany, NY). **Identification of hexachlorobenzene as a contaminant in laboratory wash bottles.** *J. Assoc. Off. Anal. Chem.* 60(1): 233-235; 1977. (8 references)

Hexachlorobenzene (HCB) is identified as a contaminant in some Nalgene plastic wash bottles by gas-liquid chromatography mass spectrometry. Of 34 new, unused Nalgene bottles tested, all 30 of the conventional polyethylene wash bottles contained significant quantities of HCB; the remaining 2 linear polyethylene and 2 polyvinyl chloride storage bottles contianed little or no HCB. (Author abstract by permission)

77-0949. Wien, R. G.; Tanaka, F. S. (U.S. Dep. Agric., Agric. Res. Serv., Metab. Radiat. Res. Lab., Fargo, ND). **Gas chromatography of *N*-methyl and *N*-aryl carbamates by flash-heater reaction with trimethylanilinium hydroxide.** *J. Chromatogr.* 130: 55-63; 1977. (22 references)

A simple derivatization procedure employing trimethylanilinium hydroxide (Methelute) is described. This method may prove useful in the analysis of certain pesticidal carbamate residues. The flash-heater reaction product derived from *N*-aryl carbamates was identified as the *N*-methyl- *N*-aryl carbamate. For the *N*-methyl carbamates, however, a methyl substitution product (aryl methyl ether) was obtained rather than the anticipated *N,N*-dimethyl carbamate. Using propham and carbaryl as representative compounds for the two classes of carbamates, the degree of reaction for each with Methelute was estimmted to be essentially quantitative. Chromatographic response was observed to be linear with increased concentration for the synthetic standards and the flash-heater products of propham and carbaryl. At the nanogram level, flash-heater reaction improved the sensitivity of detection of propham and carbaryl by approximately 30% and 400%, respectively. (Author abstract by permission)

77-0950. Tewari, S. N.; Harpalani, S. P. (Toxicol. Div., Chem. Examiner's Lab., Agra, India). **Detection and determination of organophosphorus insecticides in tissues by thin-layer chromatography.** *J. Chromatogr.* 130: 229-236; 1977. (38 references)

The toxicological analysis of 12 common organophosphorus insecticides is described. Suitable methods for the extraction of organophosphorus insecticides from tissues are proposed. The detection, identification and estimation of these insecticides by thin-layer chromatography is described for 25 solvent systems and a series of chromogenic reagents. The distribution of insecticides in human body tissues in five cases of poisoning by ethyl parathion, malathion, dimethoate, sumithion and phosphamidon has also been studied. (Author abstract by permission)

77-0951. Tewari, S. N.; Sharma, I. C. (Toxicol. Div., Chem. Examiner's Lab., Agra, India). **Insolation and determination of chlorinated organic pesticides by thin-layer chromatography and the application to toxicological analysis.** *J. Chromatogr.* 131: 275-284; 1977. (44 references)

A sensitive method for the isolation and clean-up of chlorinated organic pesticides from tissues and biological materials is discussed. *RF* values of the pesticides in 26 solvent systems and colors of the spots given with various chromogenic reagents are reported. The limits of detection and densitometric measurements are also discussed. The average recovery has been found to be 94%. The distribution of endrin in different autopsy tissues from five different victims has been studied by the proposed technique. (Author abstract by permission)

77-0952. Fasco, M. J.; Piper, L. J.; Kaminsky, L. S. (Div. Lab. Res., New York State Dep. Health, Albany, NY). **Biochemical applications of a quantitative high-pressure liquid chromatographic assay of warfarin and its metabolites.** *J. Chromatogr.* 131: 365-373; 1977. (20 references)

A quantitative high-pressure liquid chromatographic assay of warfarin and its diastereoisomeric alcohols and 4'-, 6-, 7-, 8- and benzylic hydroxylated metabolites was accomplished using a reversed-phase, microparticle column (μBondapak/C_{18}) employing 1.5% acetic acid (pH 4.7)-acetonitrile (69:31) as solvent. Concentration of these compounds on the column prior to their elution permitted the loading of 0.01-0.5 ml solutions of warfarin and metabolites without consequent alterations in peak heights and resolution. Details of the use of this technique in the study of *R* and *S* warfarin metabolism by hepatic mixed function oxidases and in the determination of warfarin and its metabolites in blood are presented. (Author abstract by permission)

77-0953. McNeil, E. E.; Otson, R.; Miles, W. F.; Rajabalee, F. J. M. (Bur. Chem. Hazards, Environ. Health

Dir., Health Prot. Branch, Health Welfare Canada, Environ. Health Cent., Tunney's Pasture, Ottawa, Ontario, Cnada). **Determination of chlorinated pesticides in potable water.** *J. Chromatogr.* 132(2): 277-286; 1977. (27 references)

A procedure is described for monitoring organochlorine pesticides in potable water. Material adsorbed from water on to Amberlite XAD-2 macroreticular resin was eluted with *n*-hexane and the concentrated eluate was analyzed without further treatment. Electron capture (^{63}ni) gas chromatography utilizing a column of 4% QF-1 and 2% SE-30 on 80-100 mesh HP Chromosorb W at 180° permitted identification of organochlorine pesticides and indicated the presence of phthalates. Confirmatory qualitative and quantitative analyses were done by specific ion-monitoring mass spectrometry. Levels determined in Ottawa drinking water was 17 ppt α-BHC, 1.3 ppt lindane, 0.7 ppt aldrin, and less than 0.05 ppt for each of heptachlor, heptachlor epoxide, dieldrin, endrin, chlordane, *o,p'*-DDT, *p,p'*-DDD, *p,p'*-DDT, and *p,p'*-DDE. (Author abstract by permission)

77-0954. Zakrevsky, J.-G.; Mallet, V. N. (Dep. Chem., Univ. Moncton, Moncton, New Brunswick, Canada). **An *in situ* fluorometric method for the detection and quantitative analysis of fenitrothion, its breakdown products and other amine-generating compounds.** *J. Chromatogr.* 132(2): 315-321; 1977. (41 references)

A procedure is described for the *in situ* detection of primary amine-generating pesticides on thin layers of silica gel. The technique is based on the reaction of fluorescamine with primary amines to yield highly fluorescent derivatives. Nitro compounds are first reduced to their corresponding primary amines. Pesticides studied were aminotriazole, (anitrole) fenitrothion, parathion and methyl parathion. Possible breakdown products of fenitrothion were also included. Detection limits were in the low nanogram range. The method is simple, rapid and very selective and can also distinguish between primary amines and nitro compounds. An example of a typical chromatographic separation is presented and quantitative aspects are discussed. (Author abstract by permission)

77-0955. Kennedy, J. H. (Tippecanoe Lab., Eli Lilly Co., Lafayette, IN 47902). **High pressure liquid chromatographic analysis of oryzalin and other selected herbicides.** *J. Chromatogr. Sci.* 15(2): 79-81; 1977. (9 references)

Procedures are described for the analysis of oryzalin, tebuthiuron, and several other selected dinitroaniline herbicides by high-pressure liquid chromatography (HPLC). Quantitation of oryzalin and small concentrations of chemical impurities from the production process can be performed rapidly. Linearity and reproducibility are discussed and comparisons to other methods are made.

77-0956. Kirichenko, V. E.; Pashkevich, K. I.; Postovskii, I. Ia. (Inst. Chem., Urals Sci. Centr., USSR Acad. Sci., USSR). **Spektrofotometricheskoe opredelenie benztiazurona v vode, pochve i kartofele.** [**Spectrophotometric determination of benzthiazuron in water, soil, and potatoes.**] *Khim. Sel. Khoz.* 5: 12-13; 1976. (6 references) (Russian)

A spectrophotometric method for the determination of benzthiazuron in soil, water and potatoes is described. After extraction with chloroform (from water) or acetone (from soil and potatoes), the extract is hydrolyzed with 60% sulfuric acid at 140°C for 2 hr, after which the solution is diluted to 40% with water, and diazotized with sodium nitrite at room temperature. Conjugation with dimethylaniline is done in the same medium. Photometric determination is done in visible light. A linear correlation was established between the optical density and the concentration in a concentration range of 10-100 μg/25 ml solution (0.4-4 μg/ml). The sensitivity of the method amounts to 0.1 mg/liter in water and 0.2 mg/kg in soil and potatoes. Coextracted substances do not interfere with the determination.

77-0957. Hargreaves, P. A.; Rapkins, S. H. (Agric. Chem. Branch, Dep. Primary Ind., Indooroopilly, Queensland, Australia). **A sample method for the analysis of picloram and 2,4-D or 2,4,5-T in mixtures and commerical formulations.** *Pestic. Sci.* 7(6): 515-520; 1976. (18 references)

A method is described for the analysis of mixtures of picloram with 2,4-D or 2,4,5-T in commercial formulations. The method involves the esterification of the acids in sealed tubes at 105°C using boron trifluoride-methanol reagent, followed by extraction, and then estimation by gas chromatography using flame ionization detection. (Author abstract by permission)

77-0958. Brown, M. J.; Williams, I. H. (Res. Stn., Agric. Canada, Vancouver, Canada). **Determination of residues of isofenphos and its phosphoramidate analogue.** *Pestic. Sci.* 7(6): 545-548; 1976. (5 references)

A method is described for the gas chromatographic determination of residues of isofenphos (BAY 92114, *O*-2-isopropoxycarbonylphenyl isopropylphosphoramidothioate) and its phosphoramidate which is a potential metabolite. When potato, cabbage, rapessed and a sandy loam soil were fortified with 0.01, 0.1 and 1.0 mg/kg and analyzed by the method described, the recoveries ranged from 76 to 98%. The limits of detection of the method were 0.5 and 1.0 ng for isofenphos and isofenphos oxygen analogue respectively. Degradation under field conditions of isofenphos to its oxygen analogue was demonstrated in a sample of field-treated potatoes. (Author abstract by permission)

77-0959. Fung, K. K. H. (Div. Agric. Chem., Dep. Agric., Melbourne, Australia). **Determination and confirmation of methomyl residues in soil and water.** *Pestic. Sci.* 7(6): 571-574; 1976. (4 references)

Gas chromatographic methods for the determination of methomyl residues in soil and water utilising the flame photometric detector are described. Complete extraction of methomyl residues in soil and water was obtained and the analytical results were reproducible. Recovery of residues was possible based on 50 g of soil and 1 liter of water. The identity of methomyl residues determined was confirmed by gas chromatography-mass spectrometry. (Author abstract by permission)

77-0906. Desmarchelier, J. M.; Elek, J. A. (CSIRO Canberra, Australia). **Determination of bromide ion content of cereals and other foodstuffs by specific ion electrode.** *Pestic. Sci.* 7(6): 595-603; 1976. (25 references)

A method is presented which determines the bromide ion content of food stuffs using a bromide specific ion electrode. For low levels of bromide (<10 mg/kg) or for accurate work, bromide was extracted from the ground commodity with water and then separated from interfering compounds by ion-exchange chromatography before estimation. Alternatively, bromide ion can be estimated approximately by direct measurement on the aqueous extracts after heating to denature proteins. The method was checked against three standard methods of bromide estimation in foods, using wheat that had been repeatedly fumigated with methyl bromide. The equipment required is inexpensive and can be adapted for field use. The method has been used to determine the bromide and chloride contents that occur naturally in wheat, maize, copra, soya beans and sorghum. (Author abstract by permission)

77-0961. Smart, N. A. (Min. Agric., Fisheries Food, Plant Pathol. Lab., Hatching Green, Harpenden, Hertfordshire, England). **Collaborative studies for methods for pesticides residues analysis.** *Residue Rev. 64: 1-16; 1976. (54 references)*

Reasons are given for the importance of thoroughly establishing methods of pesticides residues analysis by collaborative study, particularly as national and possibly international tolerances are now being set. The organization of a collaborative study is discussed, placing emphasis on the role of the associate referee or coordinating laboratory. Collaborative studies in this field that have been reported in the literature are reviewed. The earliest work is briefly referred to but the results of the more recent AOAC and UK work are summarized in more detail. The variations that arise between analysts and laboratories are discussed drawing attention to having as complete a description of the method as possible, so as to reduce these variations. Criteria for the acceptability of results from collaborative study are difficult to arrive at but some generally used guidelines are given. The need for further collaborative studies of commonly-used residues methods is stressed. (Author abstract by permission)/A

77-0962. Eyem, J. (LKB-Produkter AB, 161 25 Bromma 1, Sweden). **Quantitative analysis of trace components in extracts of biological fluids by mass fragmentography with glass capillary columns.** *Science Tools* 23(3): 43-45; 1976. (5 references)

Analyses of DDT were made using glass capillary chromatographic columns with a solid-sample injection device. The latter has a movable glass needle on the tip of which is placed a 1-3 μl droplet of the sample solution. After evaporation of the solvent in the backstream of the carrier gas outside the oven, the needle, with the sample, is dropped into the oven and the sample is practically instantaneously evaporated onto the fore end of the column. Dieldrin was used as an internal standard and the DDT to be analyzed was dissolved in cod-liver extract. The retention times for dieldrin and DDT were 195.2 and 253.9, respectively, and were highly reproducible. The reproducibility of the quantity injected was calculated from the peak height of the internal standard. The mean peak height was 838±54 arbitrary units, which corresponds to a coefficient of variation of 6.5%. The calibration curve was straight within the concentration range used and the regression coefficient was 1-76 x 10-^{9}. The reliability of the analysis was better than that obtainable with gas chromatography.

77-0963. Goswami, K. P.; Koch, B. L. (Dep. Agron. Soil. Sci., Univ. Hawaii, Honolulu, HI 96822). **A simple apparatus for measuring degradation of ^{14}C-labeled pesticides in soil.** *Soil Biol. Biochem.* 8(6): 527-528; 1976. (5 references)

A new apparatus was designed for use in the examination of herbicide degradation rates in a large number of soil samples over a wide range of herbicides. A single apparatus consists of 12 reaction flasks connected in parallel through a series of gang valves with a single source of CO_2-free moist air. There is also an air pump controlled by a time clock. Air flow is controlled by a precision valve and monitored by a flow meter at the terminal end of the system. The air is directed through a series of washing bottles which remove CO_2 and help to eliminate possible microbial contamination of the soil samples. After the air has passed over the soil, it is routed through a column of silica gel to remove moisture. The $^{14}CO_2$ evolved from the soil is then trapped in any appropriate solution. The apparatus is inexpensive to construct, can handle numerous samples at one time, is not affected by variations in herbicide degradation rates, requires limited attention, and provides exceptional reliability.

77-0964. Shustrov, V. S.; Krasnykh, A. A. (Lab. Toxicol., All-Union Sci. Res. Inst. Plant Protect., Ramon', Voronezh Oblast, USSR). **Opredelenie morestana v vode,**

pochve i ogurtsakh metodom khromatografii v tonkom sloe. [TLC Determination of morestan in water, soil, and on cucumbers.] *Vop. Pit.* (3): 79; 1976. (Russian)

A thin-layer chromatographic method for the determination of morestan (oxythioquinox) in water, soil, and cucumbers is described. After extraction with chloroform, determination is done on a silica gel KSK plate, using a 9:1 ratio of hexane and chloroform as solvent system. The active agent is visualized in the form of green or yellow spots by spraying the plate with a mixture of equal volumes of 1% solutions of stannous chloride and ferrous ammonium sulfate in 3N sulfuric acid, after which the plate is irradiated with UV light for 10-15 minutes. Quantitative estimation is done by visual comparison of the spot surface areas and color intensities against a standard. The recovery rate amounts to 85-100% of the input; the sensitivity is 5 μg in the sample.

77-0965. Canton, J. H.; Slooff, W. (Lab. Toxicol., Nat. Inst. Publ Health, Bilthoven, The Netherlands). **The usefulness of *Lymnaea stagnalis* L. as a biological indicator in toxicological bio-assays (model substance α-HCH).** *Water Res.* 11(1): 117-121; 1977. (20 references)

Short- and long-term studies with α-hexachlorocyclohexane (α-HCH, α-BCH) were carried out on the pond snail (*Lymnaea stagnalis* L.), to test the usefulness of this organism as a biological indicator of pollutants in surface water. Based on mortality and immobilization in the short-term study (2 days) an EC_{50}-value of 1200 μg α-HCH/l could be determined. In the long-term study (70 days) an inverse time-independent relation was found between egg production rate (= number of eggs produced per unit of time) and the α-HCH concentration in the water. Based on this egg production inhibition an EC_{50} of 250 μg α-HCH/l could be determined. The percentage of fertilized eggs per capsule was not affected. No morphological abnormalities were noticed during the embryonic development, although a significantly dose-related delay occurred with respect to the hatching of the eggs. Based on the number of eggs which did not hatch, a LC_{50} of 230 μg α-HCH/l could be determined. The combination of (1) the inhibition of the egg-production of the adult snails (caused by a significant prolongation of the oviposition interval and by a significant decrease of the number per capsule) and (2) the mortality of the young during the development caused a 50% reduction of the overall reproductivity at 65 μg α-HCH/l. The heart-rate of newborn snails was slowed significantly by α-HCH. Replacing the snails into an α-HCH-free medium for 16 days, after a 40-day exposure to α-HCH, did not result in the disappearance of the effects mentioned above. The susceptibility of *Lymnaea stagnalis* to α-HCH did not differ much from that of *Daphnia magna* (a crustacean). This organism proved to be the most sensitive one of all tested organisms (*Chlorella, Daphnia, Lebistes, Salmo*) in previous studies with α-HCH. Therefore *Lymnaea stagnalis* might be useful as a test organism in future environmental toxicity studies, although these kinds of experiments have to be considered as very laborious and costly.

see also **77-0729** **77-0871**

The Administrator of the U.S. Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical approved by the Director of the Office of Management and Budget February 6, 1973.

Pesticides Abstracts is available on 16 mm microfilm. Additional information can be obtained from the Technical Services Division.

ORDER FORM FOR
PESTICIDES ABSTRACTS

To: Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Please enter my subscription for Pesticides Abstracts. I am enclosing Money Order ☐ Check ☐ for this subscription.
($18.25 a year; $4.60 additional for foreign mailing.)

Please address as follows: _____

_____

_____

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 1968

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Subscription price, domestic, $18.25 a year, $4.60 additional for foreign mailing. Price for a single copy of this issue is $1.40, Index issue $2.35.

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
RM. EB-49, 401 M STREET, S. W.
WASHINGTON, D. C. 20460

POSTAGE AND FEES PAID
FOURTH CLASS RATE BOOK
EPA-338

U.S.MAIL

If you do not desire to continue receiving this publication, please CHECK Here☐; cut off this label and return it to the above address. Your name will then be removed from the mailing list.

3EPAPP77264C 001567875001 001
UNIV MICROFILMS INTL
SERIALS PROCESSING DEPT
300 N ZEEB RD
ANN ARBOR MI 48106